Digitized by the Internet Archive
in 2025

https://archive.org/details/bwb_C0-ANZ-796

CONCORDIA UNIVERSITY
QL549.C68 C001 V
HOW TO KNOW THE BUTTERFLIES NEW YO
3 4211 000092505
WITHDRAWN

HOW TO KNOW THE BUTTERFLIES

HOW TO KNOW THE BUTTERFLIES

A MANUAL OF THE BUTTERFLIES OF THE EASTERN UNITED STATES

BY

JOHN HENRY COMSTOCK

PROFESSOR OF ENTOMOLOGY IN CORNELL UNIVERSITY

AND

ANNA BOTSFORD COMSTOCK

LECTURER IN NATURE STUDY IN CORNELL UNIVERSITY

WITH FORTY-FIVE FULL-PAGE PLATES FROM LIFE REPRODUCING THE INSECTS IN NATURAL COLORS

NEW YORK AND LONDON

D. APPLETON AND COMPANY

1913

Library

Concordia Teachers College

RIVER FOREST, ILL.

Copyright, 1904, by
D. APPLETON AND COMPANY

Printed in the United States of America

TO

SAMUEL HUBBARD SCUDDER

CONTENTS

PAGE

List of Plates ix

PART I

GENERAL ACCOUNT OF BUTTERFLIES

I. The relation of Butterflies to other Insects 1

II. The Structure of Butterflies 3

III. The Clothing of Butterflies 16

IV. The Metamorphoses of Butterflies . . . 20

V. The Study of the Life of Butterflies . . 25

PART II

THE CLASSIFICATION OF BUTTERFLIES

Superfamily Papilionoidea 35

Family I. The Parnassians 42

" II. The Swallow-tails 45

" III. The Pierids 69

" IV. The Nymphs 102

CONTENTS

PAGE

FAMILY V. THE MEADOW-BROWNS 180

" VI. THE HELICONIANS 201

" VII. THE MILKWEED BUTTERFLIES . . . 204

" VIII. THE LONG-BEAKS 210

" IX. THE METAL-MARKS 213

" X. THE GOSSAMER-WINGED BUTTERFLIES . . 215

PART III

THE SKIPPERS

SUPERFAMILY HESPERIOIDEA 256

FAMILY I. THE GIANT SKIPPERS 258

" II. THE COMMON SKIPPERS 260

INDEX 303

LIST OF PLATES

PLATE		FACING PAGE
I.	Transformations of the Monarch .	*Frontispiece*
II.	The change from a Caterpillar to a Chrysalis .	20
III.	The first three stages of a Butterfly . . .	24
IV.	Parnassians and Papilio	42
V.	The Zebra Swallow-tail	50
VI.	The Tiger Swallow-tail	52
VII.	Swallow-tail Butterflies	56
VIII.	Transformations of the Giant Swallow-tail . .	58
IX.	The Green-clouded Swallow-tail	60
X.	The Black Swallow-tail	62
XI.	Transformation of the Black Swallow-tail . .	64
XII.	The Blue Swallow-tail	66
XIII.	The Whites and the Olympia Orange-tip . .	72
XIV.	The Whites	76
XV.	The Orange-tips and the Yellows	86
XVI.	The Larger Yellows	88
XVII.	The Yellows	92
XVIII.	Fritillaries	108
XIX.	The Diana Fritillary	110
XX.	The Regal Fritillary	112
XXI.	The Three Eastern Argynnids	114
XXII.	The Smaller Fritillaries and the Crescent-spots .	122
XXIII.	The Angle-wings	134
XXIV.	The Angle-wings	140

LIST OF PLATES

PLATE		FACING PAGE
XXV.	The Mourning-cloak	148
XXVI.	The Vanessas	154
XXVII.	The Purples	166
XXVIII.	The Monarchs and their Mimics	170
XXIX.	The Emperors	174
XXX.	The Meadow-browns	184
XXXI.	The Meadow-browns	190
XXXII.	The Zebra and the Milkweed Butterflies	204
XXXIII.	Metal-marks and Hair-streaks	220
XXXIV.	Hair-streaks	226
XXXV.	Hair-streaks	232
XXXVI.	The Coppers	236
XXXVII.	The Blues	246
XXXVIII.	The Spring Azure	250
XXXIX.	Skippers with a Brand and their Allies	270
XL.	Skippers with a Brand and their Allies	276
XLI.	Skippers with a Brand and their Allies	280
XLII.	Skippers with a Brand and their Allies	284
XLIII.	The Silver-spotted Skipper	294
XLIV.	Skippers with a Costal Fold and their Allies	296
XLV.	Skippers with a Costal Fold and their Allies	298

INTRODUCTION

THERE are many students of Nature who know the more common birds and flowers; but our experience as teachers has convinced us that there are comparatively few that know the common butterflies. This fact seems remarkable when we consider the abundance of butterflies and their attractive features; and it can not be due to an unwillingness on the part of students to study these creatures. The reason for this condition must be a lack of suitable aids to beginners in this study.

The literature treating of American butterflies is a very rich one; it includes large, scholarly works with magnificent illustrations, and a considerable number of smaller manuals. But we believe that there is a field for still another book on this subject; one that is richly illustrated without a confusing array of figures of species from remote parts of our country; one with brief descriptions of species but sufficiently full so that the reader can definitely determine the species studied; and one that shall give the more impor-

tant facts of the lives of our butterflies. It is with the hope of meeting this need that this book has been written.

It is hoped that the work will be of use to students in all parts of our country; but in order that it may be of moderate size, the descriptions of species, with few important exceptions, have been restricted to those that occur in the eastern half of the United States. Many of these species, however, have a much wider distribution, some extending to the Pacific Coast.

HOW TO KNOW THE BUTTERFLIES

PART I

GENERAL ACCOUNT OF BUTTERFLIES

I. THE RELATION OF BUTTERFLIES TO OTHER INSECTS

Butterflies belong to a class of animals, the Insects, that far outnumbers in species all other classes of animals taken together. The members of this vast assemblage of species agree, however, in the more general features of the structure of their bodies.

In all insects the body is composed of a series of segments or rings; these segments are most easily seen in the hind part of the body (Fig. 1). The segmented condition of the body is also characteristic of certain other animals, as the millipedes, centipedes, lobsters, and others; but insects can be distinguished from all of these by the following combination of characteristics: they breathe by means of a system of air tubes or

tracheæ opening through the sides of the segments; the body-segments are grouped into three

FIG. 1.—A butterfly showing the segmented condition of the abdomen.

regions, the head, the thorax, and the abdomen (Fig. 2); they have one pair of antennæ; they have three and only three pairs of legs; and in the adult state they usually have one or two pairs of wings.

FIG. 2.—A wasp showing the division of the body into head, thorax, and abdomen.

The class of insects is known to the zoologists as the class *Hexapoda*, a name suggested by the six-footed condition of these creatures.

The class Hexapoda is divided into several orders; thus the beetles constitute the order *Coleoptera;* the two-winged flies, the order *Dip-*

tera; and the dragon-flies and damsel-flies, the order *Odonata.* Sixteen of these orders are commonly recognized.

The moths or "millers," the skippers, and the butterflies constitute the order *Lepidoptera.* The members of this order have four wings, which are membranous and covered with overlapping scales; the mouth-parts are formed for sucking; and in the course of their development they undergo what is known as a complete metamorphosis.

II. THE STRUCTURE OF BUTTERFLIES

The body of a butterfly consists of three regions, which are known as the *head*, the *thorax*, and the *abdomen.* The head is the first of the three regions; the thorax, the intermediate; and the abdomen, the last.

The head bears the eyes, the antennæ, and the mouth-parts.

The *eyes* are two in number, one on each side of the head. They are easily recognized by their position and hemispherical form. But when they are examined with a lens they present a very different appearance than do the eyes of man; each eye being composed of a large number of little eyes, or *ommatidia* as they are

termed. As the ommatidia are closely massed together, the outer surfaces of each is hexagonal in outline like the cells of honeycomb (Fig. 3). Eyes of this type are termed *compound.*

Many insects have simple eyes, or *ocelli*, in addition to compound eyes; but ocelli are very rarely found in butterflies.

The *antennæ* are the long, more or less thread-like appendages that project from the upper part of the head; they are what children are apt to call the horns of the butterfly. Each antenna consists of many segments or ringlike divisions. The antennæ are supposed to bear the organs of smell. In butterflies the terminal segments of the antennæ are enlarged so as to form a club.

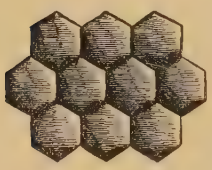


FIG. 3.—Part of a compound eye, greatly magnified.

The *mouth-parts* of butterflies consist chiefly of a pair of *palpi* and the sucking organs, *maxillæ.* The palpi are the jointed organs that project forward from the lower side of the head. They vary greatly in length in different families, and vary in the relative length of their segments, so that use is made of them in the classification of butterflies. The maxillæ are greatly modified jaws, which are so lengthened that they have lost

all resemblance to the jaws of biting insects. Each maxilla is furnished with a groove, and the two maxillæ are so fastened together that the two grooves form a tube through which liquid food is sucked. When not in use, the maxillæ are coiled between the palpi.

The thorax bears the organs of locomotion, the legs and the wings.

The *legs* are six in number. Each leg consists of a series of segments. The basal segment, that by which the leg is attached to the body, is the *coxa;* next is a small segment, the *trochanter;* then follows the principal segment of the leg, the *femur;* the next approaches the femur in size, and is the *tibia;* the remaining segments constitute the foot or *tarsus.* The last segment of the tarsus usually bears a pair of *claws.*

The *wings* are four in number and are always present in adult butterflies. In many species of moths the wings are wanting in one sex; but this is true of no butterfly.

In the study of the classification of butterflies much use is made of the variations in the structure of the wings. This is also true in the study of any of the groups of winged insects; but in the Lepidoptera, where the body is covered with

a dense clothing of scales which hides from view most of the distinguishing characteristics used in the classification of beetles and other comparatively naked insects, the structure of the wings presents an even larger proportion of the easily available criteria for separating the order into its subdivisions.

It is essential, therefore, that the student of butterflies should learn at the outset the more important facts regarding the structure of the wings, and become familiar with the terms that have been applied to the different parts of a wing. Fortunately it is an easy matter to do this.

The two pairs of wings are designated as the *fore wings* and the *hind wings* respectively. Some writers on butterflies term the fore wings the *primaries*, and the hind wings the *secondaries*.

The wings are more or less triangular in outline ; a wing, therefore, presents three margins : the *costal margin*, or *costa* (Fig. 4, *a–b*) ; the *outer margin* (Fig. 4, *b–c*) ; and the *inner margin* (Fig. 4, *c–d*).

The angles limiting these margins have also received names. The angle at the base of the costal margin (Fig. 4, *a*) is the *humeral angle ;* that between the costal margin and the outer margin (Fig. 4, *b*) is the *apex* of the wing ; and

the angle between the outer margin and the inner margin (Fig. 4, *c*) is the *anal angle.*

The wings are large membranous appendages, which are thickened along certain lines. These thickened lines are termed the *veins* of the wing; and their arrangement is described as the venation of the wings.

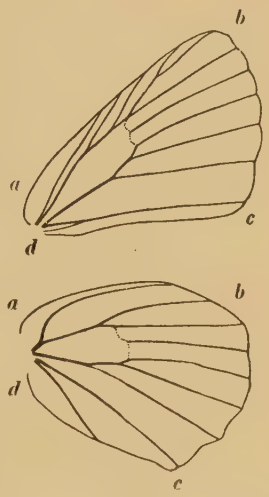


FIG. 4.—Margins and angles of a wing.

A study of the wings of all orders of winged insects has shown that there is a striking uniformity in the more general features of the venation of the wings of the more generalized or "lower" members of the different orders; while in the more specialized or "higher" members of each order this generalized type of venation is more or less modified.

An investigation of the various ways in which this generalized type of wing venation has been modified and of the varying degrees of these modifications has contributed much to our knowledge of the relationships of the different groups of insects.

These studies have shown that all winged insects have doubtless descended from a common winged ancestor. And although we do not know the exact form of this primitive winged insect, which lived during the Silurian age, we may infer that those structural features that are common to the generalized members of the different orders of winged insects have been inherited from this common ancestor.

The features of the wing-venation which are commonly present with the generalized members of the different orders of winged insects, and which we therefore infer were possessed by the primitive winged insect, are represented in Figure 5. From this hypothetical primitive type of wing-venation there can be derived, by methods of modification of which we have many illustrations among living insects, all the forms of venation of insect wings known.

The venation of the wings of butterflies is one of the more specialized types of wing-venation, and one which can not be understood by the study of the wings of butterflies alone. It is necessary, therefore, to lead up to the explanation of this type by describing more simple or less modified types. We will describe first the hypothetical primitive type and then point out the ways in

which this type has been modified in the Lepidoptera.

Taking the hypothetical type (Fig. 5) as an illustration, we see that the veins of the wings can be grouped under two heads: first, *longitudinal* veins, those that normally extend lengthwise of the wing; and second, *cross-veins*. those that

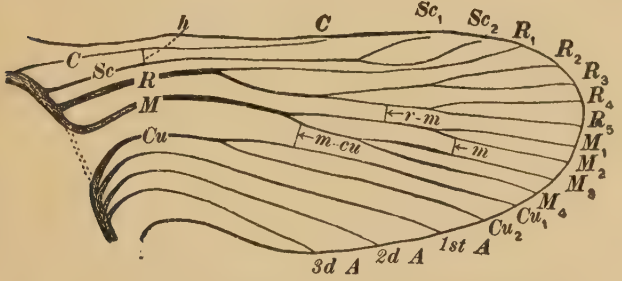


FIG. 5.—Hypothetical venation of the primitive winged insect.

extend transversely from one longitudinal vein to another.

The names that have been applied to the longitudinal veins, beginning with the one nearest the costal margin of the wing, are *costa*, *subcosta*, *radius*, *media*, *cubitus*, *first anal*, *second anal*, and *third anal*. In descriptions these veins are often designated, as they are in Figure 5, by the following abbreviations of these names: C, Sc, R, M, Cu, 1st A, 2d A, and 3d A.

Beginning with subcosta, the four veins that

traverse the middle portion of the wing are branched; the subcosta divides into two branches, the radius into five, the media into four, and the cubitus into two. In this primitive type the costa and the three anal veins are not branched.

In designating the branches of a forked vein they are numbered, beginning with the one nearest the costal margin of the wing. Thus, the first branch of radius is designated as *radius-one;* and for this term the abbreviation R_1 is used.

In some insects there are very many cross-veins, but it is believed that the greater number of these have been developed secondarily. There are, however, a few cross-veins that are so constantly present among generalized insects that we feel warranted in believing that they were present in the wings of the primitive winged insect. These are represented in Figure 5, and are designated as the *humeral cross-vein* (Fig. 5, *h*); the *radio-medial cross-vein* (Fig. 5, *r–m*); the *medial cross-vein* (Fig. 5, *m*); and the *medio-cubital cross-vein* (Fig. 5, *m–cu*).

In Figure 6 is represented the venation of the wings of *Sthenopis*, a moth, which is one of the most generalized of the living Lepidoptera. Here is found quite a close agreement in venation with

that of the hypothetical type. The more important modifications are the following:

The costa forms the costal border of the wing, and does not appear as a distinct vein. This is the case with nearly all insects; but in many pupæ the costa is distinct, and it is only in the later

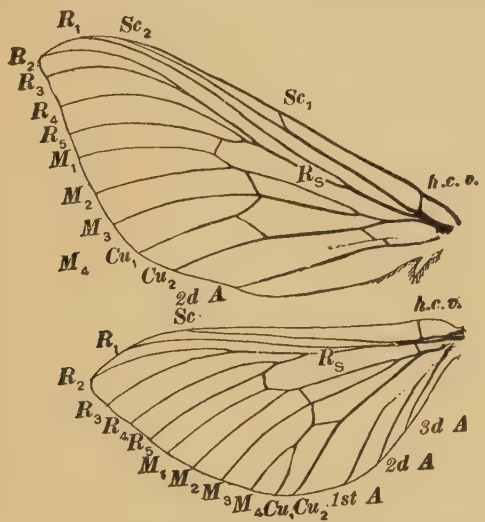


FIG. 6.—Venation of the wings of *Sthenopis*.

stages of the development of the wings that it coincides with the costal margin.

In the hind wings, veins M_4 and Cu_1 unite for a short distance, and then separate; in the fore wing these veins unite and remain united throughout the remainder of their length (Fig. 6, $M_4 + Cu_1$).

It is only in a very few Lepidoptera that there is any indication of the existence of vein M_4. In nearly all moths and in all butterflies media appears to be only three-branched; and it is customary to regard the vein labeled $M_4 + Cu_1$ in the above figure as merely cubitus-one. For the sake of simplicity this course is followed in this work.

The most striking modification of the primitive type that has taken place in the wings of butterflies is the loss of the main stem of media and the joining of the branches of media to the veins on either side. Thus vein M_1 appears to be a branch of radius; vein M_3, of cubitus; and vein M_2 is sometimes joined to radius and sometimes to cubitus. That this change has taken place is easily seen by comparing the venation of *Sthenopis* (Fig. 6) with that of the various butterflies figured here.

Not only has the main stem of media been lost, but in nearly all wings of butterflies one or two of the three anal veins have disappeared. A careful study has shown that in the reduction of anal veins in the Lepidoptera the first anal vein is the first to disappear, and the third anal vein is the next to go.

The number of the branches of a branched vein is often reduced by the growing together, or

coalescence, of adjacent veins. Thus in many butterflies radius of the fore wings instead of being five-branched is only four-branched or even three-branched (Fig. 7). In a case of this kind the designation R_{4+5} indicates that veins R_4 and R_5 have grown together to form a single vein.

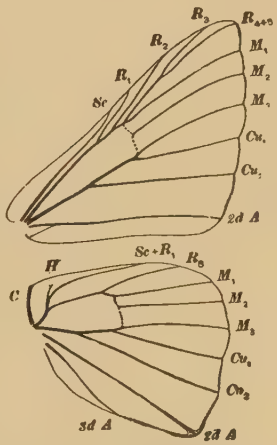


FIG. 7.—Venation of the wings of a metal-mark.

In the hind wings of all butterflies the radius differs greatly from that of the fore wings. By referring to the venation of *Sthenopis* (Fig. 6) it can be seen that at the first forking of radius the vein is divided into two unequal parts; one of these is vein R_1, the other gives rise to the remaining four branches of radius. This second part is termed the *radial sector*, and is labeled R_s in the figures. In all butterflies the branches of the radial sector of the hind wings all coalesce so as to form a single vein, and vein R_1 coalesces with the subcosta. This is well shown in the hind wing of *Papilio* (Fig. 8). It will be observed that in this wing vein R_1 soon after its separation from vein R_s joins vein Sc and the

two extend to the margin of the wing as a single vein, which for this reason is marked $Sc+R_1$. It will also be seen that the radial sector extends to the margin of the wing as an unbranched vein, marked R_s.

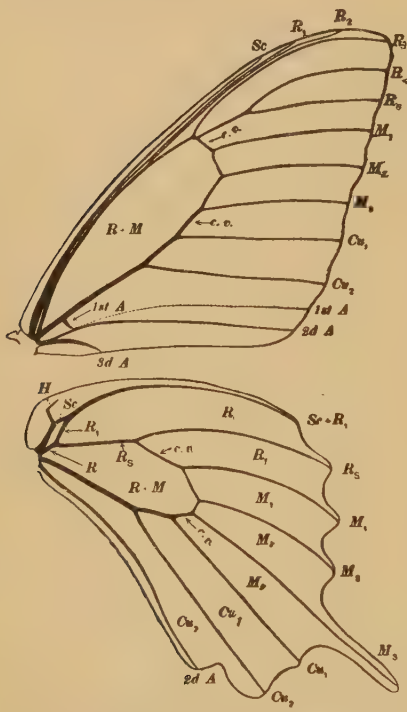


FIG. 8. — Venation of the wings of a swallow-tail.

In some butterflies a short spur extends from the subcosta near the humeral angle of the wing; such a spur is termed the *humeral vein* (Fig. 7, H).

The thin spaces of the wings which are bounded by the veins are called *cells*. In descriptions of wings, especially in indicating the location of markings, it is often desirable to refer to one or more cells. It is necessary, therefore, to have a nomenclature of the cells of the wing, as well as of the wing-veins.

Having named the wing-veins, the simplest possible method of designating the cells of the wing is to apply to each the abbreviation of the name of the vein that forms its front margin. In Figure 9 the veins are designated by letters at the margin of the figure; the cells by letters within the figure or at the ends of the dotted lines.

Near the center of the basal half of the wing there is a large cell which is bounded in front by the main stem of radius and which for this reason might be called cell R. But this cell is really composed of two cells, which have been thrown together by the fading out of the main stem of media. For this reason this cell is designated as cell R + M. This is the *discal cell* of most writers on the Lepidoptera.

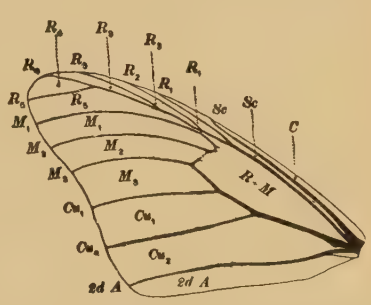


FIG. 9.—Fore wing of a butterfly with the veins and cells named.

The details of the venation of the wings can be seen best, in Lepidoptera, on the lower surface of the wings; as on this surface the veins are not so obscured by scales as on the upper

surface. If necessary the scales can be removed from a small part of a wing with a small brush in order to expose the veins. A drop of chloroform applied to a wing causes the veins to be more prominent for a moment; the chloroform soon evaporates and leaves the wing uninjured.

At the base of each fore wing there is a prominent scalelike appendage; these are known as the *patagia.*

The third and last region of the body, the *abdomen,* requires little discussion in this place. It consists of several ringlike segments, and bears appendages at the caudal end connected with the organs of reproduction. The forms of these appendages vary greatly in the different species, consequently much attention is devoted to them in the more technical works.

III. THE CLOTHING OF BUTTERFLIES

Every country lad knows that if a butterfly be handled there comes off from it upon the fingers a dustlike substance; this is the clothing of the butterfly. If this dust is examined with a microscope each particle is seen to be of regular form, although a wide range of forms may be obtained from a single butterfly. The form that is most abundant on the wings is a flattened

scale, beautifully ribbed, with a series of projecting teeth at one end, and a single pedicel at the other (Fig. 10).

If a piece of a wing of a butterfly be examined with a microscope, it will be seen that these scales are arranged in regular, overlapping rows; the arrangement being as regular as that of the scales on a fish or of the shingles on a

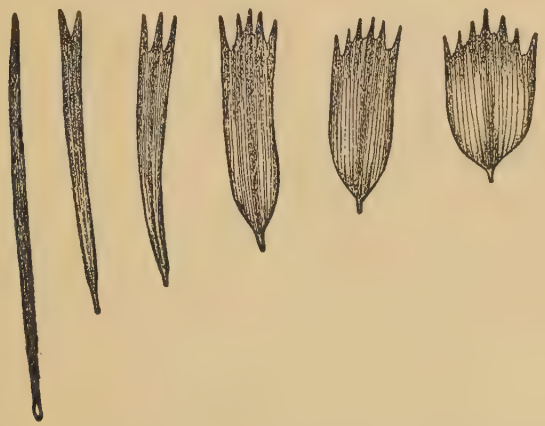


FIG. 10.—A series of scales taken from the body and wings of a single moth. (From Kellogg.)

roof (Fig. 11). In the upper part of the figure the membrane of the wing is represented with the scales removed.

The scales of butterflies are modified hairs. That is, they are hairs which, instead of growing long and slender as hairs usually do, remain

short, but grow very wide as compared with their length. Every gradation in form can be found from the ordinary hairlike form, which occurs most abundantly upon the body, to the short and broad scale, which is best seen upon the wings (Fig. 10).

The use of the scales on the wings is to strengthen them. We thus see that the wings of these insects are furnished with much fewer cross-veins than are the wings of similar size in other orders. A secondary use of these scales is that of ornamentation; for the beautiful colors and markings of these insects are due entirely to the scales, and are destroyed when the scales are removed. Upon the body, legs, and other appendages, the scales and hairs doubtless serve to protect the insect, being a sort of armor.

FIG. 11.—Part of the wing of a butterfly, greatly magnified.

In the wings of males of many butterflies there are scent glands that open through scales. It should be stated in this connection that scales, like other hairs of insects, are hollow and well

fitted to be the outlets of glands. The odor emitted by these scent-glands is supposed to attract the females; as do the bright plumage and the songs of male birds.

To these scales, characteristic of the males, has been applied the name *androconia* (an-dro-co′ni-a), a word signifying male dust.

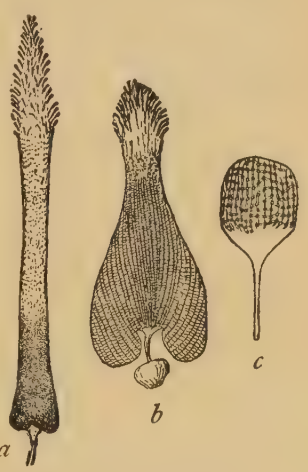


FIG. 12.—Androconia from the wings of male butterflies.

Androconia are of remarkable and various forms. "Among the Nymphalidæ the androconia are usually long, slender, and feathered at the tip (Fig. 12, *a*); in the Pieridæ they are usually fringed at the apex and heart-shaped at the base, the pedicel being peculiarly developed into a slender stem with a ball at its tip (Fig. 12, *b*); in the Lycænidæ a battledore shape is presented, the scale usually being quite small (Fig. 12, *c*). The androconia are found almost without exception on the upper side of the wings, and are more commonly met with on the fore wings than on the hind wings. They are often

found in certain limited spots or in folds of the wings." (Kellogg.)

The most familiar illustrations of the grouping of the androconia in distinct patches are in the "brands" of the males of certain skippers, and in the discal patch of the fore wings of hair-streaks. It is among the skippers also that we find the most striking examples of folds formed for containing androconia, i. e., in the skippers with a costal fold. In the milkweed butterflies the androconia are in a little pocket close to vein Cu_2 of the hind wings (see Plate xxxii.)

In caterpillars the fine hairs scattered over the surface of the body are sense-organs and are probably tactile; and it is believed that the organs of taste and of smell of insects are modified hairs. We thus see that the clothing of these insects serves many and widely different uses.

IV. THE METAMORPHOSES OF BUTTERFLIES

A butterfly in the course of its existence appears under four distinct forms; these are the egg, the larva or caterpillar, the pupa or chrysalis, and the adult.

The *eggs* are small, and consequently are rarely seen except by those who observe very closely. They are attached by the parent butter-

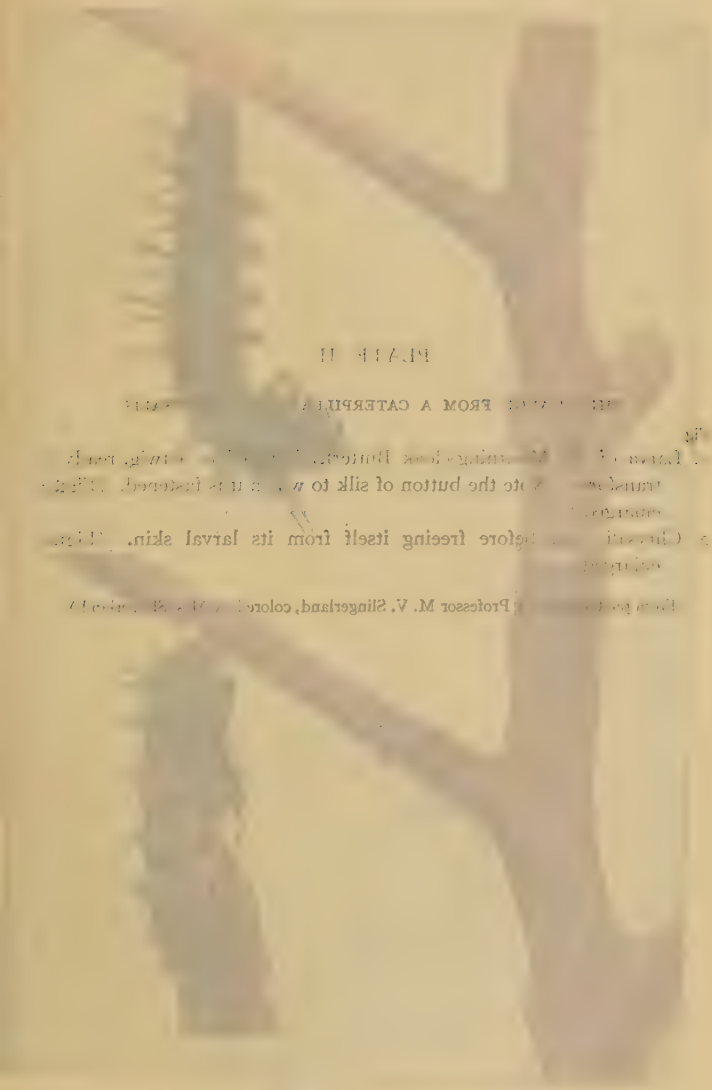


Plate II.

PLATE II

THE CHANGE FROM A CATERPILLAR TO A CHRYSALIS

Fig.

1. Larva of the Mourning-cloak Butterfly fastened to a twig, ready to transform. Note the button of silk to which it is fastened. (Figure enlarged.)
2. Chrysalis just before freeing itself from its larval skin. (Figure enlarged.)

(From photographs by Professor M. V. Slingerland, colored by Mrs. Slingerland.)

Plate II.

fly to the particular kind of plant upon which the larva feeds. The eggs may have smooth oval shells; but often the shells are beautifully ribbed and pitted (Plate III, Fig. 1; Plate XXV, Fig. 1); sometimes they are ornamented with spines, and frequently they are exquisitely colored.

When the young butterfly emerges from the egg it is what is known as a *larva*. This is a general term applied to the corresponding stage of all insects that appear under four distinct forms in the course of their development. Usually the larvæ of butterflies and moths are called *caterpillars;* both terms are used in the following pages.

Caterpillars vary greatly in appearance; but they are long, more or less wormlike in form. This fact has suggested the common names of many species; thus the cabbage-worm and the tomato-worm are caterpillars; the former is the larva of a butterfly, the latter develops into a moth.

There is no characteristic by which we can distinguish the larvæ of butterflies from those of moths; but with a little experience the student can learn to recognize the larvæ of our larger and more common butterflies.

In the caterpillar state the division of the body into three regions is not so well marked as it is with the adult butterfly. The *head* is always distinct; following the head there are thirteen comparatively similar segments, which constitute the thorax and the abdomen. The first three segments following the head form the *thorax* of the adult insect; each of these segments bears a pair of legs, which develop into the legs of the adult. The remaining ten segments constitute the *abdomen.* On the lower side of the abdomen there are five pairs of fleshy appendages, which are known as the *prolegs;* these are borne by the third to the sixth and the last abdominal segments. Each proleg is armed at the tip with a series of hooks by which it clings to the object upon which the caterpillar is walking. When a caterpillar changes to a chrysalis the prolegs are lost, being shed with the last larval skin.

The larvæ of butterflies differ greatly in respect to the clothing of the body; some are apparently naked, the few hairs with which the body is clothed being inconspicuous (see Plate XI, Fig. 2); with others the hairs are more numerous and larger (Plate IV, Fig. 1); and still others are clothed with large spines (Plate XXV, Fig. 2).

All insects in the course of their development shed their skin at regular intervals. This process is termed *molting*, and the cast skin is referred to as the *exuviæ* (ex-u'vi-æ).

Before an insect molts a new skin is formed beneath the old one; then the old skin bursts open, and the insect crawls forth, clothed in a soft skin, which stretches, if necessary, to accommodate the increased size of the insect. Very soon, however, this new skin becomes hard. Caterpillars molt four or five times during their larval life; some other insects molt many more times.

When a caterpillar is full-grown it makes preparation for the quiet period that is to follow. The larvæ of some moths go into the ground and form a cell within which the pupa state is passed; the larvæ of others spin a dense silken case about the body which is known as the *cocoon*; some of these cocoons are familiar objects. The larvæ of skippers, which are commonly classed with butterflies (see Part III), spin a cocoon; but almost no true butterflies do so.

A few butterflies undergo their transformations in a crevice or cell upon or in the ground; but nearly all species fasten themselves to some object and hang suspended during the pupa stage.

There are two distinct methods of suspension;

in one, the chrysalis hangs suspended by the tail alone (Plate I, Fig. 3), in the other, the tail is fastened in a similar manner, but there is also a girth about the middle of the body (Plate III, Fig. 3).

When a caterpillar is full-grown it stops eating and seeks a convenient place in which to transform. It then spins, upon the object to which it is to fasten itself, a button of silk, into which it fastens the prolegs at the hind end of the body. Plate II, Figure 1, represents a caterpillar which has done this and is ready to transform; and Plate III, Figure 2, represents another caterpillar which has suspended itself by a button at the tail and a girth about the middle of the body.

After suspending itself, the caterpillar rests for a time; then its skin splits open in the middle of the back, and the head end of the body is worked out through this opening. Plate II, Figure 2, represents one which was photographed just as it reached this stage in the transformation. As the shed skin dries it shrinks back toward the tail, where it is attached to the button of silk. Before the body is entirely freed from the skin, the tail of the chrysalis, which is armed with hooks, is withdrawn from it and firmly fastened to the button of silk.

PLATE III

THE FIRST THREE STAGES OF A BUTTERFLY

The

1. Eggs of the Cabbage-butterfly; greatly enlarged
2. Full-grown larva of the Cabbage-butterfly, fastened up by a button of silk at the tail and a girth around the middle, ready to transform; enlarged.
3. Chrysalis of the Cabbage-butterfly; enlarged

(From photographs by Professor M. V. Slingerland, colored by Miss Slingerland.)

PLATE III

THE FIRST THREE STAGES OF A BUTTERFLY

Fig.

1. Eggs of the Cabbage-butterfly; greatly enlarged.
2. Full-grown larva of the Cabbage-butterfly, fastened up by a butto of silk at the tail and a girth around the middle, ready to tran form; enlarged.
3. Chrysalis of the Cabbage-butterfly; enlarged.

(From photographs by Professor M. V. Slingerland, colored by Mrs. Slingerland.)

1

2

3

Plate III.

The duration of the chrysalis state varies greatly; in the summer time in many cases it is only a few days; on the other hand, it may be several months, as is the case with those that pass the winter in this state.

When the butterfly emerges from the chrysalis skin, the wings are at first small and limp. The butterfly hangs for a time by the legs; the wings expand rapidly, and soon become stiff and fitted for flight. On Plate I, Figure 4, and Plate XXV, Figure 3, are represented recently emerged butterflies which were waiting for their wings to dry.

V. THE STUDY OF THE LIFE OF BUTTERFLIES

If one would know the butterflies he must study their lives, and their relations to each other. We do not feel that we are acquainted with a man when we merely know his name; and our acquaintance with a butterfly is only begun when we have determined its species. The learning of the names of species should be regarded as merely a means, not the end of our studies. It is necessary to learn by what name an insect is known in order to find out what has been published regarding it; but having learned the name we should not stop there. The name is merely the key that

will let us into the storehouses of knowledge accumulated by our predecessors.

The determining of the name of a butterfly may teach us much about the insect if it be done in the better way; for there are two ways in which the names of the species described here can be determined. The student may learn the name by comparing a specimen with the pictures. This is probably the way in which many who use the book will begin; and some will not be able to devote the time to this subject necessary to study it in a more serious manner.

But there is another way of classifying our specimens, one by means of which we may learn something of the relation of the various kinds to each other, and of their distinguishing characteristics, that is, by the use of the analytical tables, which are given throughout the book. The student is advised, even when he knows the name of a species, to make use of the tables for the sake of learning the distinctive characteristics pointed out in them.

After a species has been properly classified, we are ready to begin the study of its life. This will be found to be the most fascinating part of the study; for it includes the watching of the ways of the butterflies in the field, the observing

of their transformations, and, often, the working out of the relations between the different forms of the same species.

In studying the transformation sone may begin either with larvæ or with eggs; the latter way is the more desirable, but more difficult. By careful watching, one can often see a butterfly laying its eggs upon the food plant of its larva, and in this way obtain them; but if one fails to find the eggs, it is easy to find the larvæ later. In many cases the eggs can be readily obtained by caging a living female butterfly with the proper food plant.

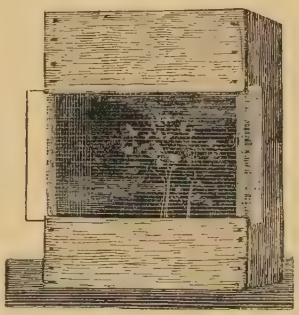


FIG. 13.—A home-made breeding-cage.

Breeding-cages are necessary for rearing caterpillars. A good home-made cage can be built by fitting a pane of glass into one side of an empty soap-box. A board, three or four inches wide, should be fastened below the glass so as to admit of a layer of soil being placed in the lower part of the cage, and the glass can be made to slide, so as to serve as a door (Fig. 13). The glass should fit closely when shut, to prevent the escape of

insects. The soil is put into the box so that if larvæ of moths are reared they may have a chance to go into the ground to transform.[1]

Branches of the proper food plant should be stuck into bottles or cans which are filled with sand saturated with water. By keeping the sand wet the plants can be kept fresh longer than in water alone, and the danger of the larvæ being drowned is avoided by the use of sand.

Hibernating chrysalids may be left in the breeding-cages or removed and packed in moss in small boxes. Great care should be taken to keep moist the soil in the breeding-cages, or the moss if that be used. The cages or boxes containing the pupæ should be stored in a cool cellar, or in an unheated room, or in a box placed out of doors where the sun can not strike it. Low temperature is not so much to be feared as great and frequent changes of temperature.

An excellent breeding-cage can be made by combining a flower-pot and a lantern-globe or a large lamp-chimney ; the top of the lantern-globe is covered with Swiss muslin.

The student of butterflies needs a collect-

[1] The following suggestions for breeding insects and the care of specimens are taken, in large part, from the work by the senior author, *Insect Life*, published by D. Appleton and Company, New York.

81851

ing outfit, consisting of a net, a killing-bottle, a few vials or pill-boxes for bringing home living larvæ, a cork-lined collecting box, and a vial of chloroform with a small brush fitted in the cork.

FIG. 14.—An insect-net.

The usual form of an insect-net is shown in Figure 14, and the killing-bottle in Figure 15. The bottle is prepared in the following manner:

Take a wide-mouth bottle holding four or six ounces. Put in this a piece of cyanide of potassium, about three-fourths of an inch square, and water enough to cover the cyanide; and then immediately, before there is time for the cyanide to dissolve, put enough plaster of Paris in the bottle to entirely soak up the water. In this way the cyanide will be firmly cemented in place in the bottom of the bottle. The bottle should then be left open in a shady place for an hour to dry, and then securely corked with a long cork and labeled *Poison*, after which it is ready for use.

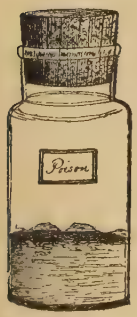


FIG. 15.—A killing-bottle.

In using a cyanide bottle care should be taken not to leave it open unnecessarily, lest it lose its

strength. With proper care a bottle will retain its strength for several months.

Specimens placed in the bottle to be killed should be left there for at least a half hour. They may be left in the bottle several hours, even overnight, without injury.

Collectors of butterflies usually have a shallow tin box, lined with pith or cork, into which specimens can be pinned, and fitted with a strap by means of which it can be slung over the shoulder (Fig. 16). A cheap substitute for such a box can be made by using a shallow cigar-box, lined with cork and fitted with a strong cord.

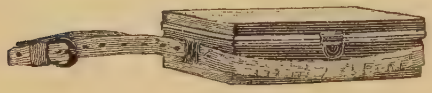


FIG. 16.—A collecting-box.

There is another method of caring temporarily for specimens of butterflies, which is used when it is not convenient to pin them. The specimen is killed while it is yet in the net with chloroform or by pinching the thorax, care being taken that the wings are folded together above the back, so that they shall not be rubbed. Then the specimen is dropped into a triangular envelope made by folding a piece of paper, as shown in Figure 17, and a memorandum of the locality and date

of capture is written on the envelope. When it is desired to pin and spread specimens that have been stored in this way, they are relaxed by put-

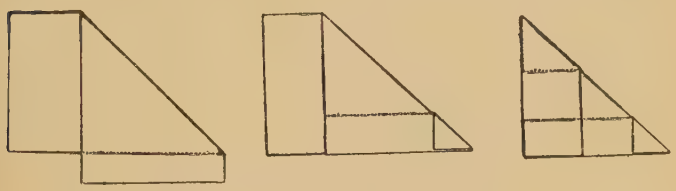


FIG. 17.—Folded papers for butterflies.

ting them on damp sand in a tightly closed vessel and leaving them there two or three days.

For pinning insects a special kind of pin is ordinarily used—one made of slender wire—so that the specimens are mutilated as little as possible (Fig. 18). These can be procured of any dealer in entomological supplies. The pin is pushed through the middle of the thorax, and about one-fourth of its length is left projecting above the specimen.

FIG. 18.—Insect-pins.

It is necessary that specimens of butterflies be "spread" before they are placed in a cabinet. For doing this a device known as a spreading-board is used. This consists of two strips of wood fastened a short dis-

Library
Concordia Teachers College
RIVER FOREST, ILL.

tance apart, so as to leave a groove for the body of the insect, upon which the wings are fastened in position and left until the insect is dry (Fig. 19). A narrow strip of cork is tacked to the lower side of the two strips of wood; this closes the groove below, and serves as a support for the pin upon which the insect is pinned. Another strip of wood is fastened to the lower side of the cleats to which the two strips are nailed. This serves as a bottom, and protects the points of the pins which project through the piece of cork.

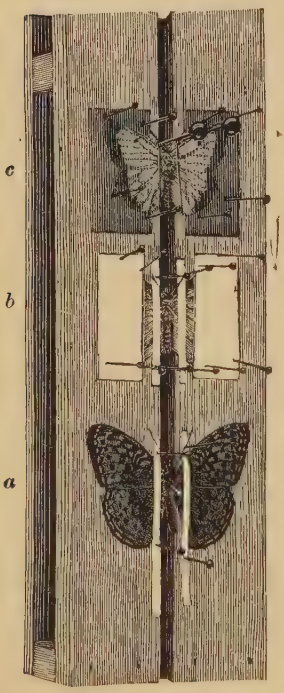


FIG. 19.—A spreading-board.

In spreading a specimen a narrow piece of paper is used on each side to hold the wings in place till they are properly arranged (Fig. 19, *a*). The wings are moved into position by slipping them forward or backward under the slips of paper, using for this purpose a fine pin, which is inserted near a strong vein of the wing.

When the wings are properly arranged their entire surface is covered with wider strips of paper (Fig. 19, *b*). The specimens are left on the boards till they are dry; this usually requires two or three days.

For pinning the sheets of paper over the wings the sharp-pointed "mourning-pins" are much better than ordinary brass pins; and thin sheets of mica are often used instead of sheets of paper (Fig. 19, *c*).

If one wishes to keep a collection of butterflies, it is essential that they be stored in tightly covered boxes, for there is a small beetle—the museum pest—which is sure to destroy the specimens if it can reach them. Various styles of insect cases are sold by dealers; we prefer those that have a glass top, and which may be stored as drawers in a cabinet (Fig. 20). By using this kind, the specimens can be seen without opening the case.

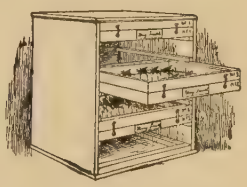


FIG. 20.—A cabinet.

The value of a collection of butterflies will be greatly enhanced if specimens of the eggs, larvæ, and chrysalids be preserved with the adults. The chrysalids should be killed in a cyanide bottle;

they can then be pinned and preserved dry. It is more difficult to preserve caterpillars, on account of the soft nature of the body. They can be preserved in vials of alcohol; this is the simplest way. But the fact that the appearance of many larvæ is greatly altered by preserving them in alcohol leads many entomologists to remove the viscera from such larvæ and inflate and dry the skins. The process is somewhat difficult and disagreeable to perform, but if it is well done very beautiful specimens are obtained, which preserve the form and color of the larvæ much better than those prepared in any other way (Fig. 21).[1]

FIG. 21.—A blown larva.

In collecting butterflies each specimen should be carefully labeled with the name of the locality in which it was taken and the date of capture. While this is important for all specimens, it is especially so in the study of those species that occur under different forms in different sections of the country, and those in which the successive generations of a year present a different appearance.

[1] Directions for inflating larvæ are given in *Insect Life*, pp. 301–303.

PART II

THE CLASSIFICATION OF BUTTERFLIES

Superfamily Papilionoidea (Pa-pil-i-o-noi'de-a)

In learning to know the butterflies the student will find his work simplified, and his enjoyment of it greatly increased, if he early learns something of the grouping of the species into families, and of the principal divisions of the families.

This can be done, without learning the more technical characteristics upon which this grouping is based, by reference to the following synopsis of families. The technical distinctions are given later in a tabular form.

SYNOPSIS OF THE GROUPS OF BUTTERFLIES

The Parnassians, *Family Parnassidæ*, p. 42.
The Swallow-tails, *Family Papilionoidæ*, p. 45.
The Pierids, *Family Pieridæ*, p. 69.
The Whites, p. 71.
The Orange-tips, p. 81.
The Yellows, p. 84.

THE NYMPHS, *Family Nymphalidæ*, p. 102.
THE FRITILLARIES, p. 104.
THE CRESCENT-SPOTS, p. 123.
THE ANGLE-WINGS, p. 131.
THE SOVEREIGNS, p. 162.
THE EMPERORS, p. 173.
THE MEADOW-BROWNS, *Family Agapetidæ*, p. 180.
THE HELICONIANS, *Family Heliconidæ*, p. 201.
THE MILKWEED BUTTERFLIES, *Family Lymnadidæ*, p. 204.
THE LONG-BEAKS, *Family Libytheidæ*, p. 210.
THE METAL-MARKS, *Family Riodinidæ*, p. 213.
THE GOSSAMER-WINGED BUTTERFLIES, *Family Lycænidæ*, p. 215.
THE HAIR-STREAKS, p. 217.
THE COPPERS, p. 236.
THE BLUES, p. 244.

The butterflies, the skippers, and the moths or "millers" constitute the order Lepidoptera. The student will have no trouble in recognizing the members of this order as such. But it may often happen that there is doubt as to whether a given insect is a moth, a skipper, or a butterfly. The more available characteristics for dis-

tinguishing these groups are given in the following table.[1]

A. Lepidopterous insects (*i. e.*, insects with the wings clothed with scales) in which the antennæ are of various forms, but never threadlike with a knob at the extremity. Not discussed in this book. THE MOTHS.

AA. Lepidopterous insects in which the antennæ are threadlike with a knob at the extremity.

B. With the radius of the fore wings five-branched, and with all of the branches arising from cell R + M (Fig. 22); the club of the antennæ usually terminated by a recurved hook. (*Superfamily Hesperioidea*), p. 256. THE SKIPPERS.

BB. With some of the branches of the radius of the fore wings coalesced beyond the apex of cell R + M;[2] the

[1] The following is the method of using the analytical tables given in this book: Read carefully the statement of characteristics given opposite A and AA respectively, and by examining the insect to be classified determine which is true of this insect. This will indicate in which division of the table the name of the group to which the insect belongs is to be looked for. If this division of the table is subdivided, pass to B and BB *in this division* and determine in a like manner under which the insect belongs. Continue in this way, passing to the letters C, D, E, etc., in regular order till the name of the group is reached. Then turn to the page indicated and read the description of the group given there, comparing the specimens withthe description.

[2] In some butterflies two or more branches of radius of the fore wings coalesce to the margin of the wing (Fig. 23); in this case all of the branches may appear to arise from cell R + M, as with the skippers, but the fact of such coalescence is shown by the number of the branches of radius being less than five. See page 38, Fig. 23.

club of the antennæ not terminated by a recurved hook. (*Superfamily Papilionoidea*), p. 35.

THE BUTTERFLIES.

Of the eleven families of butterflies represented in America north of Mexico, one (the *Ithomiidæ*)

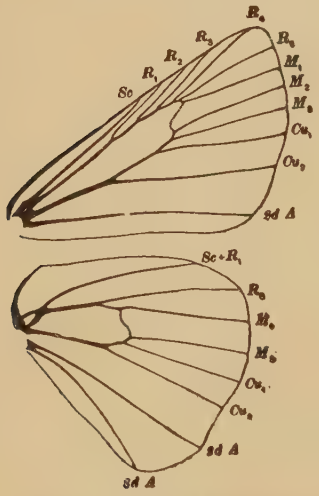


FIG. 22.—Venation of the wings of a skipper.

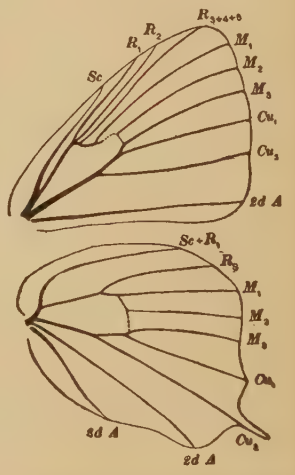


FIG. 23.—Venation of the wings of a hair-streak, *Thecla*.

is represented only by three tropical species whose range extends into the extreme southwestern part of our territory. This family will not be discussed here. The remaining ten families can be separated by the following table:

TABLE FOR DETERMINING THE FAMILIES OF BUTTERFLIES[1]

A. Butterflies in which the cubitus is apparently four-branched; and in which the anal area of the hind wings is more reduced than the anal area of the fore wings, as in the fore wings there are always two anal veins, and usually all three are at least partially preserved, while in the hind wings there is only a single anal vein (Fig. 25).

B. The outer margin of the hind wings rounded, without a tail-like prolongation. (*Parnassiidæ*), p. 42. THE PARNASSIANS.

BB. Hind wings with one or more tail-like prolongations. (*Papilionidæ*), p. 45. THE SWALLOW-TAILS.

AA. Butterflies in which cubitus is apparently three-branched; and in which the anal area of the fore wings is more reduced than the anal area of the hind wings, the former having a single anal vein and the latter two (Fig. 27).

B. Palpi much longer than the thorax. (*Libytheidæ*), p. 210. THE LONG-BEAKS.

BB. Palpi not as long as the thorax.

C. With only four well-developed legs, the front legs being unused, much shorter than the others, and folded on the breast like a tippet; radius of the fore wings five-branched. To determine the number of branches of radius, count the two cubital and the three medial branches first; the branches left between vein M_1 and the subcosta belonging to radius (Fig. 30).

[1] For a table of the families of skippers see page 257.

D. With some of the veins of the fore wings greatly swollen at the base (Fig. 36). (*Agapetidæ*), p. 180.
THE MEADOW-BROWNS.

DD. With none of the veins of the fore wings unusually swollen at the base.

E. Antennæ clothed abundantly with scales, at least above.

F. Fore wings at least twice as long as broad; in the only species occurring in America north of Mexico the wings are black banded with yellow. (*Heliconidæ*), p. 201.
THE HELICONIANS.

FF. Fore wings rarely twice as long as broad, and then not black banded with yellow. (*Nymphalidæ*), p. 102. THE NYMPHS.

EE. Antennæ apparently naked. (*Lymnadidæ*), p. 204. THE MILKWEED BUTTERFLIES.

CC. With six well-developed legs, although in some species the fore legs of the male are a little shorter, and the tarsi of these lack one or both claws; radius of the fore wings (except in some orange-tips, p. 81) only three- or four-branched (Fig. 27).

D. The first branch of media (vein M_1) of the fore wings arising at or near the apex of cell R + M (Fig. 39), except in the wanderer (p. 237).

E. Hind wings with a costa and a humeral vein (Fig. 39). (*Riodinidæ*), p. 213.
THE METAL-MARKS.

EE. Hind wings with neither a costa nor a humeral vein. (*Lycænidæ*), p. 215.

THE GOSSAMER-WINGED BUTTERFLIES.

DD. The first branch of media of the fore wings united with the last branch of radius for a considerable distance beyond the apex of cell R M (Fig. 27). (*Pieridæ*), p. 69. THE PIERIDS.

FAMILY I

THE PARNASSIANS

Family Parnassiidæ (Par-nas-si'i-dæ)

THE parnassians are butterflies of medium size in which the ground color of the wings is white shaded with black, and marked with round red or yellow spots margined with black (Plate IV, Fig. 3).

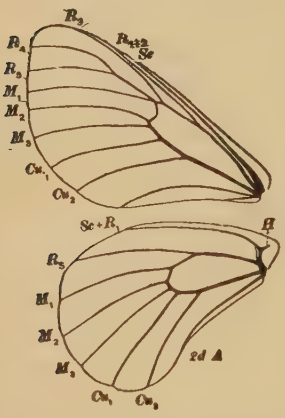


FIG. 24.—Venation of the wings of *Parnassius*.

In structure the parnassians are closely allied to the swallow-tails; but in their general appearance they show little resemblance to them, differing in the ground color of the wings, and in lacking the tail-like prolongation of the hind wings.

The most striking characteristics of the venation of the wings are that the cubitus appears to be four-branched, and the anal area of the hind wings is more reduced than the anal area of the fore wings (Fig. 24); in both of these respects they resemble the swallow-tails and differ from all other butterflies. The apparently four-branched condition of cubitus is due to the fact that vein M_2 as well as vein M_3 is joined to cubitus; while in other butterflies, except the swallow-tails, vein M_2 is

PLATE IV

PAPILIONIDÆ AND PIERIDÆ

Fig.
1. Larva of Papilio ajax showing the scent-organs, uneverted, protruded.
2. Chrysalis of Pamassius
3. The Swinhoe's Butterfly, Pieris swinhoei
4. The Black Swallow-tail, Papilio polyxenes, male.

PLATE IV

PARNASSIANS AND PAPILIO

Fig.

1. Larva of *Parnassius* showing the scent-organs, *osmateria*, protruded.
2. Chrysalis of *Parnassius*.
3. The Smintheus Butterfly, *Parnassius smintheus*.
4. The Black Swallow-tail, *Papilio polyxenes*, male.

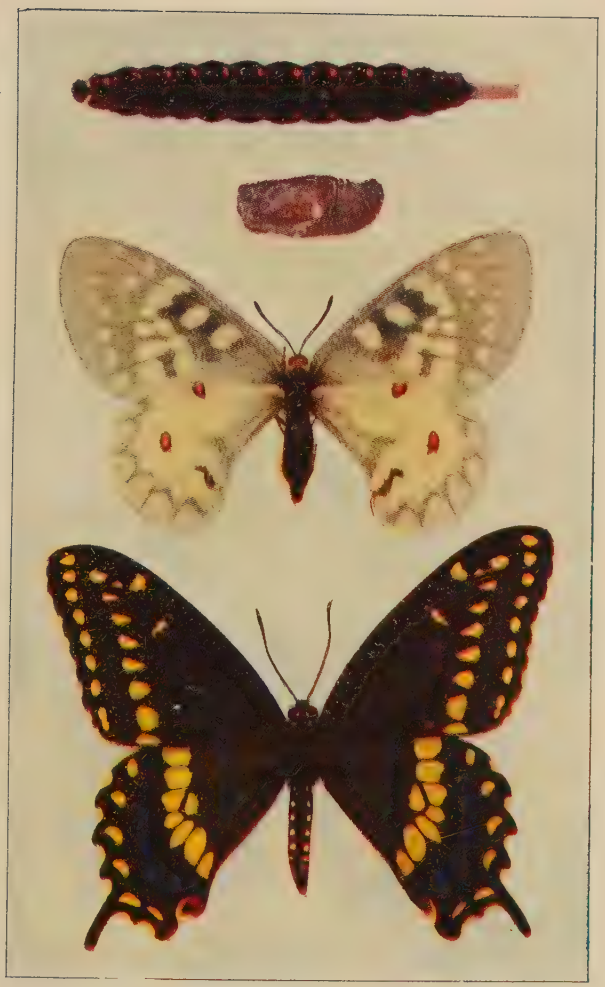


Plate IV.

joined to radius. In the anal area of the hind wings only a single vein remains; while in the anal area of the fore wings two anal veins are distinctly preserved. In the fore wings veins R_1 and R_2 coalesce, which reduces the number of the branches of radius to four.

The larvæ (Plate IV, Fig. 1) possess the peculiar scent-organs known as *osmateria;* these are also possessed by the larvæ of swallow-tails and by no other butterfly larvæ. The osmateria are described later, in the discussion of the larvæ of swallow-tails. The larva when about to pupate either draws a leaf or leaves about its body by a few threads or it merely hides under some object on the ground.

The pupa (Plate IV, Fig. 2) is cylindrical and rounded, not angulate like those of the swallow-tails.

Only four species have been found in North America; they all belong to the genus *Parnassius.* Of the four species, two are Alaskan; the others occur in the mountains of the Pacific States, in Wyoming, and in the Rocky Mountains. One of these, *Parnassius smintheus* (Par-nas'si-us smin'the-us), is represented on Plate IV, Fig. 3.

Though the butterflies of the tropics may delight our eyes with their beautiful colors, yet we must needs climb high mountains to realize the possibilities of beauty which these little creatures possess. We would naturally suppose that those butterflies found on high mountains and in cold regions would be leathery of wing and dull of color; but this is a wrong supposition, for we find on the wings of these mountain-top

butterflies a beautiful combination of white with a lemon-yellow tinge and soft brownish gray enlivened by spots of vermilion margined with black. The upper gray portion of the wing is quite transparent, so that the writing on the labels beneath the museum specimens may be read easily through this delicate medium ; and we wonder again at the exquisite frailty of these insects which endure the rigor of high altitudes and arctic conditions.

FAMILY II

THE SWALLOW-TAILS

Family Papilionidæ (Pa-pil-i-on'i-dæ)

THESE magnificent butterflies are easily recognized by their large size and the tail-like prolongation of the hind wings. The ground color of the wings is black, which is usually marked with yellow, and often with metallic blue or green.

The swallow-tails agree with the parnassians and differ from all other butterflies in the fact that vein M_2 of the fore wings appears to be a branch of cubitus, making this vein appear to be four-branched (Fig. 25), and also by the fact that the anal area of the hind wings is more reduced than the anal area of the fore wings, the former containing only a single anal vein,

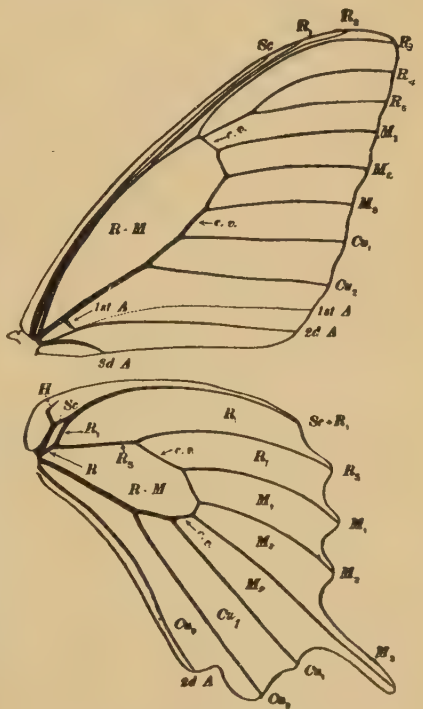


FIG. 25.—Venation of the wings of a swallow-tail.

the latter two in the parnassians and three in the swallow-tails. In the swallow-tails radius of the fore wings is five-branched, veins R_1 and R_2 being distinct although closely parallel.

The caterpillars are never furnished with spines, but are either naked or clothed with a few fine hairs. In a single species in our fauna (*Laertias philenor*) the body of the larva bears fleshy filaments.

A striking peculiarity of the larvæ of this family is the presence of a pair of bright-colored fleshy "horns," which can be projected from a slit in the dorsal wall of the prothorax. (Plate XI, Fig. 2.) These have been termed *osmateria* (os-ma-te'ri-a), and are supposed to be organs of defense; for they exhale, when pushed out, an odor which in some species is exceedingly disagreeable. They are little long pockets which are turned wrong side out when used, thus throwing out in the atmosphere all of the odor that has been secreted in them. These caterpillars are the polecats of the insect world.

The chrysalids are thickened in the middle and taper considerably at each end; they are more or less angulated, and have certain parts excessively produced; they are suspended by the tail and by a loose girth around the middle. (Plate XI, Fig. 1.)

The Papilionidæ includes many species; more than twenty of them have been found in America north of Mexico, and eight occur in the eastern United States. The following table will aid in the determination of these:

A. With a red or orange-colored spot on the upper side of the hind wings near the anal angle; club of antennæ usually strongly curved upward.

B. Front wings crossed by several bands of greenish white. (*I. ajax*), p. 49. THE ZEBRA SWALLOW-TAIL.

BB. Front wings not crossed by bands of greenish white.

C. The larger part of the disk of the wings yellow. (*P. glaucus*), p. 51.
THE TIGER SWALLOW-TAIL (*Turnus Form*).

CC. The larger part of the disk of the wings black.

D. Principal markings of the upper side of the front wings nearly parallel with the costal margin; wings black above, yellow beneath. (*P. thoas*), p. 56. THE GIANT SWALLOW-TAIL.

DD. Principal markings of the front wings parallel with the outer margin; wings black above and below.

E. Hind wings crossed near the middle of the upper surface with a band of yellow, or with a row of yellow spots; this in addition to a subterminal row of spots, and a series of marginal lunules of the same color.

F. Yellow band near the middle of the hind wings distinctly interrupted with black on the veins.

G. Tails of hind wings about four times as long as broad. (*P. polyxenes*), p. 62.
THE BLACK SWALLOW-TAIL.

GG. Tails of hind wings only about twice as long as broad. (*P. brevicauda*), p. 61.
THE SHORT-TAILED PAPILIO.

FF. Yellow band near the middle of the hind wings barely, it at all, interrupted by the veins. (*P. palamedes*), p. 55.

THE PALAMEDES SWALLOW-TAIL.

EE. Hind wings without a band of yellow near the middle of the upper surface.

F. Hind wings with a red or orange-yellow spot in cell R_1 on the upper surface.

G. Lower surface of hind wings with two transverse rows of orange spots, the row near the middle consisting of a well-marked spot in each cell except cell M_3. (*P. troilus*), p. 59.

THE GREEN-CLOUDED SWALLOW-TAIL.

GG. The row of orange spots near the middle of the lower surface of the hind wings only feebly represented. (*P. glaucus*), p. 51.

THE TIGER SWALLOW-TAIL (*Glaucus Form*).

FF. The yellow spot in cell R_1 on the upper surface, if present, of the same color as the submarginal row of spots. (*P. polyxenes*), p. 62.

THE BLACK SWALLOW-TAIL (*Female*).

AA. Without a red or orange-colored spot on the upper side of the hind wings near the anal angle; club of antennæ not curved upward. (*L. philenor*), p. 66.

THE BLUE SWALLOW-TAIL.

The Zebra Swallow-tail

Iphiclides ajax (Iph-i-cli'des a'jax)

Plate V, Fig. 1, 2

This butterfly differs from all other swallow-tails found in the eastern half of the United States in having the wings crossed by several bands of greenish white. This is one of the most interesting of our butterflies, as it occurs under three distinct forms, two of which were considered for a long time distinct species. Without taking into account the more minute differences these forms can be separated as follows:

(1) The Early-spring Form, *Iphiclides ajax marcellus* (marcel'lus).—This form expands from two and six-tenths inches to two and eight-tenths inches; and the tails of the hind wings are about six-tenths inch in length and tipped with white. (Plate V, Fig. 1.) This form was described by Mr. Edwards under the name *walshii* and is still often incorrectly so called.

(2) The Late-spring Form, *Iphiclides ajax telamonides* (tel-a-mon'i-des).—This form is a little larger than *marcellus* and has tails nearly one-third longer; these tails are bordered with white on each side of the distal half or two-thirds of their length.

(3) The Summer Form, *Iphiclides ajax ajax*.—The summer form is still larger, expanding from three and two-tenths inches to three and one-half inches, and has tails nearly two-thirds longer than the early-spring form. (Plate V, Fig. 2.) Owing to an unfortunate error this form is often called *marcellus*.

The life-history of this species has been carefully worked out by Mr. W. H. Edwards. He has shown that there are

several generations each year, and that the winter is passed in the chrysalis state. But the early-spring form and the late-spring form are not successive broods; these are both composed of individuals that have wintered as chrysalids, those that emerge early developing into *marcellus*, and those that emerge later developing into *telamonides*. All of the butterflies produced from eggs of the same season, and there are several successive broods, are of the summer form, *ajax ajax*.

CATERPILLAR.—Length about two inches. Largest at the third thoracic segment, which is made conspicuous by a wide black velvety band edged with yellow. The rest of the body is pea green with narrow cross bands of yellow and black.

Food-plants.—Pawpaw, spice bush, and upland huckleberry.

This gorgeous butterfly is well named, for its wings are cross-striped in a way that at once suggests a zebra or a tiger. To accentuate the beauty of these colors and markings two purplish-blue crescents ornament the anal angle of the hind wing, and above each there are one or two spots that look like drops of blood; on the lower surface the "blood" trickles across the entire wing.

This species responds to the influence of the seasons. The first form to appear in the spring with the peach blossoms is called *marcellus;* it has the "swallow-tails" of moderate length. The form that appears next is *telamonides*, which has longer tails; while the form that occurs in midsummer, *ajax ajax*, has still longer tails, and the

Plate V.

PLATE V

THE ZEBRA SWALLOW-TAIL

Fig.

1. The Early-spring Form, *Iphiclides ajax marcellus.*
2. The Summer Form, *Iphiclides ajax ajax.*

Plate V.

tips of the front wings are also extended. It is as if summer in a pleasant mood had seized this butterfly by the tips of each pair of wings and stretched them out, making it larger and far more gracefully proportioned than the forms which came from the winter chrysalis. Though it may be more beautiful in form, this later variety, *ajax ajax*, has almost buried its purple crescents in black and has but one drop of "blood" on the upper surface of each hind wing. It seems to have neglected its colors in order to produce tails an inch long.

The zebra swallow-tail is common in the south-eastern United States. It flies low with much fluttering and is found about low thickets. The caterpillar is well protected by its scent organs, which when protruded give off a sickish odor. The winter is passed in the chrysalis stage.

The Tiger Swallow-tail

Papilio glaucus (Pa-pil'i-o glau'cus)

Plate VI, Fig. 1, 2

In the adult state two distinct forms of this insect occur. These differ so greatly in appearance that they were long considered distinct species. They may be distinguished as follows :

(1) The Turnus Form, *Papilio glaucus turnus* (Plate VI, Fig. 1).—The wings are bright straw-yellow above, and pale,

faded straw-yellow beneath, with a very broad black outer margin, in which there is a row of yellow spots. On the fore wings there are four black bars, extending back from the costa; the inner one of these crosses the hind wings also. This species is represented by both sexes, and is found in nearly all parts of the United States and Canada.

(2) The Glaucus Form, *Papilio glaucus glaucus* (Plate VI, Fig. 2.)—In this form the disk of the wings is entirely black, but the black bands of the Turnus form are faintly indicated, especially on the lower surface, by a darker shade. The marginal row of yellow spots is present, and also the orange spots and blue scales of the hind wings. This form is represented only by the female sex, and occurs only in the more southern part of the range of the species, i. e., from Delaware to Montana and southward. In this region both yellow and black females have been reared from eggs produced by a single female.

CATERPILLAR.—Enlarged at the third thoracic segment and about two inches long when fully grown. In color it is deep green, and the enlarged thoracic segment bears on each side a large greenish-yellow spot edged with black enclosing a black streak above and having a pupil of blue bordered with black. The hind edge of the first segment of the abdomen is banded with yellow and the front edge of the next segment is banded with black.

Food-plant.—Birch, poplar, ash, wild cherry, fruit trees, and many other trees and shrubs.

The tiger swallow-tail disports itself on its great yellow wings from the Atlantic to the Pacific and from Canada to the Gulf of Mexico.

Plate VI.

PLATE VI

THE TIGER SWALLOW-TAIL

Fig.

1. The Turnus Form, *Papilio glaucus turnus.*
2. The Glaucus Form, *Papilio glaucus glaucus.*

Plate VI.

And as if to demonstrate that it is truly at home wherever it may be and that it has no race or color prejudice, it has in the South wives that are black. It is a brave flyer and lifts itself easily over houses and trees. It is especially a habitant of the latter; from our upper windows we have watched it fluttering about among the tip-top branches quite as much at home as on the lilac bushes or on the peonies of the lawn. It has a catholic taste in the matter of odor, and is equally devoted to fragrant flowers and to waste matter by no means fragrant. Its especial weakness is tobacco smoke. When fishing in the Adirondacks it was one of the daily diversions of the senior author, while resting to smoke a cigar, to watch the tiger swallow-tails come one by one out of the wilderness and flutter about him with every sign of enjoyment; if he held quite still, they would settle comfortably on his forehead or shoulders a little to the leeward so as to enjoy to the utmost the luxury of a second-hand smoke.

The caterpillar has most interesting ways: it makes at first a silken rug on the leaf where it rests when not feeding (Fig. 26). When fully grown it pulls the edges of the leaf together slightly and weaves a web across, thus making for itself a spring mattress on which to doze; it

keeps its bed very clean and never bites into the leaf on which it is spread. That bird would be brave indeed which would touch one of these caterpillars if it simply saw the front end of the body; the thorax with its fierce yellow eye-spots looks like the head of a wicked little green snake; and this deceptive appearance is heightened when the scent organs are shot out forked, like a snake's tongue, while the caterpillar rocks itself to and fro with a most insidious motion. This false face deceives even the novice in entomology who believes these spots are true eyes, whereas the latter are mere dots on the head of the caterpillar.

FIG. 26.—The larva of the tiger swallow-tail upon its bed.

In the far North the tiger swallow-tail is single-brooded; it is double-brooded in New York State and triple-brooded in the Gulf States. It passes the winter as a chrysalis.

Yes! There came floating by
Me, who lay floating too,
Such a strange butterfly!
Creature as dear as new:

Because the membraned wings
So wonderful, so wide,
So sun-suffused, were things
Like soul and nought beside.

BROWNING.

THE PALAMEDES SWALLOW-TAIL

Papilio palamedes (Pa-pil'i-o pal-a-me'des)

PLATE VII, FIG. 1

This species is found in the southern half of the United States, east of the Mississippi. It resembles to a great extent in color and markings the black swallow-tail (Plate IV, Fig. 4); but it is a much larger insect, expanding from four inches to four and six-tenths inches, and differs in markings as follows. The yellow band near the middle of the hind wings is barely if at all interrupted by black on the veins; and the orange-colored spot near the anal angle has not a black center. On the thorax and head there is a yellow line extending from the tip of the patagia to the base of the front legs, encircling the inner edge of the eye, and including the palpi.

CATERPILLAR.—The last two thoracic and the first abdominal segments are enlarged. The body is pale velvety green in color, specked and marked with lighter green. It is buff below. The eye-spots on the third thoracic segment are black, and have a glassy black pupil in a circle of orange. Scent-organs yellowish brown.

Food-plants.—Magnolia, Persea, sassafras.

Palamedes looks like a giant male of the black swallow-tail, as its wings are black and are margined and banded with yellow spots. The habits

of the butterfly are graphically described thus by Dr. Wittfield. "Palamedes roosts on the highest tree it can find, oak or palmetto. I have seen four to six near sundown fluttering about the tree where they finally settle and remain. Sometimes three or four rest on one palmetto leaf with spread wings."

The caterpillar behaves very much like that of troilus, folding the leaf together and holding it there with silken threads crossed, and hiding within. However, it differs from troilus in this respect, that it eats the leaf of which the nest is made until it is too small for protection and then it moves on to another leaf. This species is confined to the southern half of the United States, east of the Mississippi. In the more southern part of its range there are at least three broods annually; and the winter is passed by both larvæ and chrysalids.

The Giant Swallow-tail

Papilio thoas (Pa-pil'i-o tho'as)

Plate VII, Fig. 2; Plate VIII

This is the largest North American butterfly known, expanding from four inches to five and a half inches. The wings are black above and yellow beneath. The front wings are crossed on the upper side by a row of ten, more or less

Plate VII

PLATE VII

SWALLOW-TAIL BUTTERFLIES

Fig.

1. The Palamedes Swallow-tail, *Papilio palamedes.*
2. The Giant Swallow-tail, *Papilio thoas.*

The Giant Swallow-tail

Papilio thoas (Pa-pil'i-o tho'as)

Plate VII, Fig. 2; Plate VIII

Plate VII.

confluent, yellow spots extending from the apex to the basal half of the inner margin. There is near the base of the hind wings a yellow band, which, when the wings are spread, is continuous with the longitudinal row of spots of the front wings. There is also a row of yellow spots extending from the middle of the longitudinal row on the front wings to near the anal angle of the hind wings.

This species pertains especially to the South ; but it appears to be slowly and steadily invading the North. There are four broods of this butterfly in Florida and two at the northern limit of its distribution.

This is the species commonly known as *Papilio cresphontes ;* but it was first named *thoas* by Linnæus.

CATERPILLAR.—Length about two inches. The front part of the body is much expanded. In color it is reddish mottled brown ; a saddle at the middle, the two or three rear segments, and the stripes at the side near the front are dirty cream white. There is a row of more or less obscure eye-spots across the swollen thoracic segment.

Food-plants.—Orange and other citrus foliage, rue, prickly ash, Lombardy poplar, and others.

On broad and leisurely wing the giant papilio is invading the North. It is still sufficiently rare in the New England and Middle States, so that there the heart of the butterfly lover stands still when he gets a glimpse of these magnificent black wings crossed with brilliant yellow, wings that look on the under side as if they were lined with some delicate lemon-colored fabric which

allows the markings to show through. It is ever an indolent beauty, and loves to settle on flowers and let its wings droop while it luxuriates in a sun bath. When disturbed, no butterfly of them all has a flight so dignified and haughty as that of the giant swallow-tail ; it scorns to escape the net by a margin of more than three or four inches.

The caterpillar (Plate VIII) is a most unprepossessing creature in appearance. At best it is an elongated brown and white blotched object pinched in the middle and looking far more like bird-lime than like a thing of life. However, if disturbed it lifts the head and throws out a pair of long orange horns which exhale a stench that renders its immediate neighborhood quite uninhabitable by man or bird. The species is three- or four-brooded in the Southern States, and occurs there in such numbers as to be most destructive to the citrus fruit trees. In the North it feeds upon wild plants ; so we here may with a clear conscience give ourselves up to the enjoyment of this largest and most striking butterfly of our fauna. It was taken in New York first in 1864. The first specimen was taken at Ithaca in 1899, and since then a limited number of the butterflies have appeared here each year.

Plate VIII.

PLATE VIII

TRANSFORMATIONS OF THE GIANT SWALLOW-TAIL

Fig.

1. Two chrysalids; one, at the right, removed from its girth to sho
   dorsal view, *Papilio thoas*.
2. Larva, the Orange-dog, *Papilio thoas*.

(From photographs by Professor M. V. Slingerland, colored by Mrs. Slingerland.)

Plate VIII.

Brave butterfly, what wild ambition filled thy breast
To leave thy orange-groves and fling on chilling breath
Of Northern winds thy golden cross? What race unrest
Hath driven thee here to bravely battle frost and death?

The Green-clouded Swallow-tail

Papilio troilus (Pa-pil'i-o tro'i-lus)

Plate IX, Fig. 1, 2

Wings black; front wings with a row of pale straw-colored or greenish spots near the outer margin; and in some specimens a part of a second row parallel to this extends from the inner margin. On the lower side this second row is much more distinct. The discal half of the hind wings is profusely powdered with either pale yellow-green or pale blue-green scales, these scales forming a cloud near the middle of the wing. On the upper side of the hind wings there is an orange spot near the middle of the costal margin and one near the anal angle; and near the outer margin there is a row of six pale yellow-green or pale blue-green lunules. On the lower side there are two rows of orange spots, each row consisting of seven, except that the spot of the inner row in cell M_3 is very small or wanting; its place being occupied by an extension of the blue or green cloud, which covers the basal part of the area between the two rows of spots.

This species is found in the Atlantic States and in the Northwest Territories.

Caterpillar.—Body largest at the third thoracic segment; length when fully grown about two inches. In color it is dark green above and lighter green underneath. The eye-spots on the enlarged segment are light yellow and double

pupiled, a turquoise blue pupil above and a black velvety one below. There are a pair of pale yellow spots rimmed with black and with blue centers near the front edge of the first abdominal segment. Each of the other abdominal segments bears six blue oval dots edged with black.

Food-plants.—Spice bush, sassafras, and others.

The whole color effect of this butterfly when on the wing is velvety black with a sheen of green that shades into the paler greenish spots on the border of the wings. The tails are paddle-shaped and are set at right angles to the plane of the wing, so that when seen from above they look like mere lines. The green-clouded swallow-tail flies swiftly, and its shimmering wings seem never to tire as it flutters on and on just above the low herbage of low-lying fields or the marshy growth of open wet woods.

The caterpillar is most secretive in character; when young, it bites a furrow from near the tip of a leaf to the midrib and folds the end over on the leaf, holding it there by loose threads of silk; in this retreat it rests. In its later stages it folds together the two edges of an entire leaf, leaving a passageway next to the petiole out of the nest thus made. It keeps this nest very clean and never feeds upon the folded leaf of its home, always going forth to eat other leaves when it is hungry.

PLATE IX

1. Papilio troilus, male.
2. Papilio troilus, female

[illegible] pupil above and a black velvety [illegible] These are a pair of pale yellow spots rimmed with black and with blue centers near the front edge of the first [illegible] segment.

[illegible] six blue oval dots edged with black.

Food-plants.—Spice bush, sassafras, and others.

The whole color effect of this butterfly when [illegible]

PLATE IX

THE GREEN-CLOUDED SWALLOW-TAIL

Fig.

1. *Papilio troilus*, male.
2. *Papilio troilus*, female

[illegible] marshy growth of open wet woods.

[illegible] made. It keeps this nest very clean and never [illegible] ing forth to eat other leaves when it is hungry.

Plate IX.

The peculiar double eye-spots on the thorax give a sullen look to the mock face. When it moves it does so by a series of spasmodic glides, which added to the glowering effect of the eye-spots is most disconcerting and terrifying to the bird that stops to look before it leaps.

This species is very common in the South and is not rare in the North. It is double-brooded and passes the winter as a chrysalis.

The Short-tailed Papilio

Papilio brevicauda (Pa-pil'i-o brev-i-cau'da)

This species resembles the black swallow-tail in color and in the arrangement of its markings; but it is sharply distinguished by the brevity of the tail-like extensions of the hind wings, as these are only about twice as long as broad; and in the female the inner row of spots of the front wings are more or less orange and as distinct as in the male. This species is known only from Newfoundland and the shores and islands of the Gulf of St. Lawrence. The wings expand from two and three-fourths inches to three and one-half inches.

Caterpillar.—This closely resembles the caterpillar of the black swallow-tail. When fully grown it may be green crossed by black stripes, or black crossed by white or pale green stripes. Its scent-horns are bright yellow.

Food-plants.—Parsley and other Umbelliferæ.

In this species we evidently have another instance of the niggardliness of the cold North.

The short-tailed papilio resembles the black swallow-tail in almost every particular except that the female may have orange instead of yellow markings and that in both sexes the tails are reduced to mere points. It is as if the butterfly in the short northern season was obliged to economize somewhere and so gives up the luxury of swallow-tails. The caterpillar has learned to cope with the climatic conditions and hides itself among the leaves during the cold nights; and it gets thoroughly warmed by day by sunning itself on the stones and coarse gravel which become heated by the midday sun.

The Black Swallow-tail

Papilio polyxenes (Pa-pil'i-o po-lyx'e-nes)

Plate IV, Fig. 4; Plate X; and Plate XI

The wings are black, crossed with two rows of yellow spots, and with marginal lunules of the same color. The two rows of spots are much more distinct in the male (Plate IV, Fig. 4) than in the female (Plate X), the inner row on the hind wing forming a continuous band crossed with black lines on the veins. Between the two rows of spots on the hind wings there are many blue scales; these are more abundant in the female. Near the anal angle of the hind wing there is an orange spot with a black center. On the lower surface of the wings the yellow markings become mostly orange and are heavier.

PLATE X

THE BLACK SWALLOW-TAIL

Fig.

1. Fig. Papilio polyxenes, female.
2. Papilio polyxenes, female; variety with the first row of yellow spots
   indistinct.

For figure of the male, see Plate IV. Fig. 1.

and that in both sexes the tails are reduced to mere points. It is as if the butterfly in the short northern season was obliged to economize energy and so gives up the luxury of swallow-

PLATE X

THE BLACK SWALLOW-TAIL

Fig.

1. *Papilio polyxenes*, female.
2. *Papilio polyxenes*, female; variety with the first row of yellow spots indistinct.

For figure of the male, see Plate IV, Fig. 4.

Plate X.

This species is found throughout the United States and in the southern part of Canada.

Owing to an unfortunate mistake this species is commonly known under the specific name *asterias*.

CATERPILLAR.—Length about two inches. In the early stages it is angular and covered with spiny warts; the color is black with a white saddle at the middle. When fully grown it is green and each segment has a black band across it which near its front edge encloses six yellow spots. The scent-horns are orange.

Food-plants.—Parsley, wild carrot, caraway, celery, and other Umbelliferæ.

This graceful butterfly haunts the weedy waysides, the flower beds on lawns, and the kitchen gardens in every state in the Union, though it is found but rarely in the Rocky Mountain region. The female is more familiar to us than is the male, perhaps because her habits of egg-laying make her bolder when visiting the garden herbs on which her young must feed. Her wings are so much darker and have so much more metallic blue on them than do the yellow banded wings of the male that the two sexes are often regarded as different species by the amateur collector.

When we were children "caraway-worms," as we called the caterpillars that fed on that spicy herb in our backyard, were favorite playmates of ours; at least we played with them, though we

have never known how they esteemed us. We watched them by the hour from the time they were little black spiny creatures until they attained the gorgeous green, gold and black velvet costume of mature larvahood. We saw them shed their "dresses" on little silken carpets which they seemed to weave for the purpose. We admired the neat and methodical way in which they trimmed off the caraway leaf, taking a leaflet at a time up one side, and making a "clean job" of it down the other. We poked them with straws to make them push out their orange horns, and we understood that this was an act of defiance; but we never thought of connecting with it the strong, sickening odor of caraway which we often perceived when playing with the caterpillars. Once we saw two large ones marching with slow, dignified tread toward each other on a slender stem; on they came until they were in actual contact, and then they drew back spitefully and butted each other like a pair of billy goats; we heard the whacks distinctly three or four times, when both suddenly turned around in a panic and fled in the opposite direction with all possible haste.

The "caraway-worms" were the ones that revealed to us the mystery of the pupa and butterfly. We saw one climb up the side of a house

the right, an immature larva.

(From photographs by Professor M. V. Slingerland, colored by Mrs. Slingerland.)

Plate XI.

PLATE XI

TRANSFORMATION OF THE BLACK SWALLOW-TAIL

Fig.

1. Chrysalis.
2. At the left, a full-grown larva with the scent-organs protruded; at the right, an immature larva.

(From photographs by Professor M. V. Slingerland, colored by Mrs. Slingerland.)

Plate XI.

and watched it as with many slow, graceful movements of the head it wove for itself the loop of silk which we called the "swing" and which held it in place after it changed to a chrysalis. We wondered why such a brilliant caterpillar should change to such a dull-colored object, almost the color of the clapboard against which it hung. Then one day we found a damp, crumpled black butterfly hanging to the empty chrysalis skin, its wings "all mussed," as we termed it, and we gazed at it pityingly; but even as we gazed the crumpled wings expanded and then there came to our childish minds a dim realization of the miracle wrought within that little dingy, empty shell.

In the North this species is double-brooded, and winters as a chrysalis. The adults of the first brood appear in May, those of the second brood about the middle of July.

Thou wingèd blossom! liberated thing!
What secret tie binds thee to other flowers
Still held within the garden's fostering?
Will they, too, soar with the completed hours,
Take flight and be like thee
Irrevocably free,
Hovering at will o'er their parental bowers?

T. W. Higginson.

The Blue Swallow-tail

Laertias philenor (La-er'ti-as phi-le'nor)

Plate XII, Fig. 1, 2

The front wings are lustrous blackish brown ; the hind wings are blackish with green or blue reflections. The fringe on the outer margin of the wings is alternately black and white, the white appearing conspicuous by contrast. Parallel to the outer margin is a row of whitish spots ; these may be very indistinct or wanting on the front wings. Beneath, the spots are more distinct, especially the row on the hind wings, which consists of seven large orange spots. The discal half of the hind wings is very bright by reflected light. Expanse of wings from three and one-half inches to four and one-half inches.

Caterpillar.—Length nearly two inches. The body is nearly cylindrical and naked. In color it is dark purplish brown, almost black, with a row or two of coral-red dots along each side. On the segments at either end of the body are pairs of brown fleshy filaments prolonged and extended like horns.

Food-plants.—Dutchman's-pipe, the Virginia snakeroot, black bindweed.

Once an individual of this species was our comrade during a June sojourn in Virginia. Day after day we watched it floating about close to the ground in the open space of the park about the hotel. It visited all the flowers in the beds and spent long periods sunning itself near the piazza, where we were able to observe it close at

Plate XII.

PLATE XII

THE BLUE SWALLOW-TAIL

Fig.

1. *Laertias philenor*, male.
2. *Laertias philenor*, female.

Plate XII.

hand at our leisure. This was a fascinating occupation, for at every movement of the graceful body a blue-green wave of metallic sheen would start somewhere in the blackness of the velvet front wings and surge and break over the hind wings in a shimmering glow that sent a thrill of delight to our color-loving senses. When we followed it around we found that though it fluttered lazily and aimlessly on, it knew quite well what it was about and did not choose to let us come too near.

An interesting fact about the male of the species is that he has the inner margin of the hind wing folded over, including scent-scales. This unique pocket full of perfume he undoubtedly carries for the purpose of attracting and delighting his lady-love.

These butterflies, being very fond of nectar, visit many flowers and are especially useful in carrying the pollen baskets of the orchids. When we look at the weird flower called the Dutchman's-pipe and see how curiously it is arranged to be an effective death-trap to smaller insects, we feel that poetic justice is meted to the plant which produces it, when we find its large round leaves eaten greedily by a robust caterpillar. The long projecting filaments give the

caterpillar an untidy and funguslike appearance; its scent-organs give off little odor so far as we can detect. In its northern range the species is double-brooded, and winters sometimes as a butterfly and sometimes as a chrysalis. It is rarely found in New England, but is common in the Southern States and on the Pacific Coast.

> The velvet nap which on his wings doth lie,
> The silken down with which his back is dight,
> His broad outstretchèd horns, his hairy thighs,
> His glistening colors and his glorious eyes.
>
> SPENSER

FAMILY III

THE PIERIDS (Pi-er'ids)

Family Pieridæ (Pi-er'i-dæ)

THESE butterflies are usually of medium size, but some of them are small; they are nearly always white, yellow, or orange, and are usually marked with black. They are the most abundant of all our butterflies, being common everywhere in fields and roads. Some species are so abundant as to be serious pests, the larvæ feeding on cultivated plants.

The characteristic features of the venation of the wings are the following (Fig. 27): vein M_2 of the fore wings is more closely connected with radius than with cubitus, the latter appearing to be three-branched; vein M_1 of the fore wings coalesces with radius

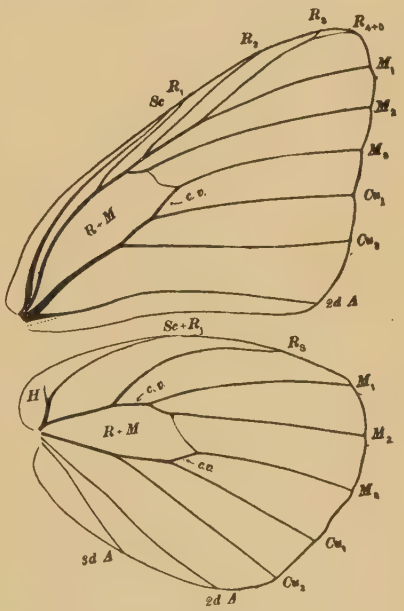


FIG. 27.—Venation of the wings of *Pontia protodice*.

for a considerable distance beyond the apex of cell R + M; and only three or four of the branches of radius remain distinct.

In this family the fore legs are well-developed in both sexes, there being no tendency to their reduction in size, as in the following families.

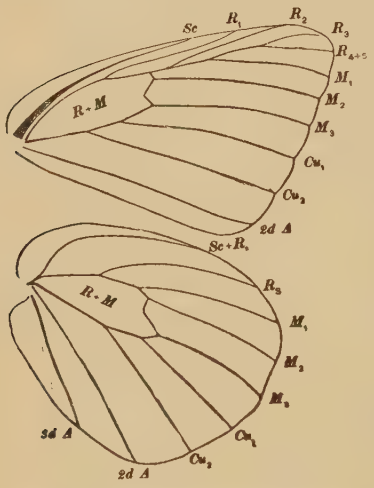


FIG. 28.—Venation of the wings of *Eurymus philodice*.

The larvæ are usually slender, green worms clothed with short, fine hairs; the well-known cabbage-worms are typical illustrations.

The chrysalids are supported by the tail and by a loose girth around the middle. They can be distinguished at a glance by the presence of a single pointed projection in front. (Plate III, Fig. 3.)

In order to facilitate the study of the family, our genera can be separated, somewhat arbitrarily, into three groups; these are the Whites, the Orange-tips, and the Yellows. In the first two groups the prevailing color is white; in the third, it is either yellow or orange. These groups can be separated as follows:

A. Vein M_2 of the front wings arising from radius, and cutting off obliquely the apex of cell R + M; radius of the front wings only three-branched, or if four-branched with one branch (vein R_3) exceedingly short, arising just

before the margin of the wing (Fig. 27). Prevailing colors white, p. 71. THE WHITES.

AA. Vein M_2 of the front wings arising from the cross-vein at the end of cell R+M, the apex of this cell not cut off obliquely by it (Fig. 28); radius of front wings distinctly four- or five-branched (except in Nathalis, in which it is only three-branched, but in this genus vein M_2 clearly arises from the cross-vein, arising nearly midway between veins M_1 and M_3).

B. Lower side of hind wings marked with a greenish network. Prevailing colors white, p. 81.

THE ORANGE-TIPS.

BB. Under side of hind wings not marked with a greenish network. Prevailing colors yellow, or orange, p. 84.

THE YELLOWS.

THE WHITES

The more common representatives of this group are the well-known cabbage-butterflies; in fact, all of the species that occur in the eastern United States feed upon cabbage and allied plants. They are white butterflies more or less marked with black; occasionally the white is tinged with yellow, and yellow varieties of our white species sometimes appear.

Our Eastern forms can be separated by the following table:

A. Unusually large species, expanding from two to three inches. (*P. monuste*), p. 72.

THE GREAT SOUTHERN WHITE.

AA. Smaller species, expanding about two inches or less.

B. With a black bar at the end of cell R+M. (*P. protodice*), p. 73. THE CHECKERED WHITE.

BB. With no black bar at the end of cell R + M.

C. Wings usually without spots, but sometimes with a dark spot in cell M_3 of the fore wings. (*P. napi*), p. 75. THE GRAY-VEINED WHITE.

CC. Lower side of fore wings with a dark spot in cells M_3 and Cu_2; upper side of hind wings with a spot in cell R_5. (*P. rapæ*), p. 78. THE CABBAGE BUTTERFLY.

THE GREAT SOUTHERN WHITE

Pontia monuste (Pon'ti-a mo-nus'te)

PLATE XIII, FIG. 1

This species is the largest of our Eastern pierids, expanding from two to three inches. In the *male* the wings are almost entirely white except a very narrow black border on the costal and outer margins of the fore wings. In the *female* the black margins are wider, and the outer margin of the hind wings is marked with a series of black triangular spots; there is also on the fore wings a bowed black band bordering cell R + M in front and at the outer end.

CATERPILLAR.—Length a little over one and one-half inches; head large; general color of the body lemon yellow with purple stripes.

Food-plants.—Cabbage, lettuce, and turnip.

A very interesting note has been made on the migratory habits of this species by Dr. Mellichamp, of Bluffton, S. C. He says: "Thousands of these white butterflies have been steadily pass-

PLATE XIII

THE WHITES AND THE OLYMPIA ORANGE-TIP

Fig.

1. The Great Southern White. Pontia monuste, male.
2. The Checkered White. Pontia protodice, female, lower side of wings.
3. The Checkered White, the Typical Form. Pontia protodice, male.
4. The Checkered White, the Typical Form, female.
5. The Checkered White, the Spring Form, Pontia protodice, female, male.
6. The Checkered White, the Spring Form, female
7. The Olympia Orange-tip, Synchloe olympia.
8. The Olympia Orange-tip, lower side of wings.
9. The Checkered White, Spring Form, male, lower side of wings.

PLATE XIII.

THE WHITES AND THE OLYMPIA ORANGE-TIP

Fig.

1. The Great Southern White, *Pontia monuste*, male.
2. The Checkered White, *Pontia protodice*, female, lower side of wings.
3. The Checkered White, the Typical Form, *Pontia protodice protodice*, male.
4. The Checkered White, the Typical Form, female.
5. The Checkered White, the Spring Form, *Pontia protodice vernalis*, male.
6. The Checkered White, the Spring Form, female.
7. The Olympia Orange-tip, *Synchlœ olympia*.
8. The Olympia Orange-tip, lower side of wings.
9. The Checkered White, Spring Form, male, lower side of wings.

Plate XIII.

ing over this place from west to east apparently against the wind for two days. Being white, they can be seen at a long distance, and they come along in twos, threes, and fours, and sometimes in greater numbers, seldom stopping, going steadily fifteen or twenty feet above the earth. A colored man stated that they came into his field like a swarm of bees, and he was so frightened at this that he dropped his hoe and came home."

The great Southern white is widely distributed in the Gulf States; it occurs also in the greater portion of the southern continent as well as in the West Indies; it is a common species over a large extent of territory.

The Checkered White

Pontia protodice (Pon'ti-a pro-tod'i-ce)

Plate XIII, Fig. 2–6, and 9

There are two forms of this species, which are designated as *Pontia protodice protodice* and *Pontia protodice vernalis* respectively.

(1) The Typical Form, *Pontia protodice protodice.*—The two sexes differ greatly in appearance. In the *male* the wings are white above and below; at the outer end of cell R+M of the front wings there is a dark bar which is usually divided by a line of white scales on the medial cross-vein; there is also a submarginal row of three more or less distinct spots,

and the outer margin is more or less dusky; the hind wings are without spots.

In the *female* the bar at the outer end of cell R+M and the submarginal spots are present and are more conspicuous than in the male. There is in addition to these, on the upper surface, a row of triangular spots on the outer margin of both fore and hind wings, and a submarginal zigzag bar on the hind wings. On the lower surface, the veins, especially of the hind wings, are more or less tinged with greenish yellow, and flecked with gray.

Expanse of wings one and six-tenths inches to two and one-fourth inches.

(2) The Spring Form, *Pontia protodice vernalis.*—This form of the species is much smaller than the typical one; it appears in early spring, and in much smaller numbers than the later broods, which are of the typical form. On the lower surface the greenish-gray banding of the veins of the hind wings is much broader, so that the white is reduced to narrow, wedge-shaped spots.

CATERPILLAR.—Length about an inch. The body is cylindrical and downy. It is striped lengthwise with yellow and greenish purple dotted finely with black. It has a small head.

Food-plants.—Cabbage and other Cruciferæ.

The females of this species are the ones that are attired in checkered raiment, the males being dotted rather than checkered, which, by the way is not a very good term for the beautiful diamond design on the wings of the female. The cater-

pillar feeds upon the outer leaves of the cabbage, and, therefore, is less obnoxious than that of *Pieris rapæ*, which bores holes into the cabbage heads. It is triple-brooded, and spends the winter as a chrysalis. The individuals which come from these hibernating chrysalids are smaller than those of later broods, as if they had literally been pinched with the cold. These small butterflies were for some time considered a distinct species.

The checkered white is distributed over the whole United States, though its natural home is in the Mississippi Valley. It was once very abundant; but the introduction of the European species has imposed upon the checkered white a checkered career and it is now rarely taken.

The Gray-veined White

Pieris napi (Pi'e-ris na'pi)

Plate XIV, Fig. 6–9

In the most common form the wings are white above and below, with a scarcely perceptible tinge of greenish yellow. Sometimes there is a dark spot in cell M_3 of the fore wings, but usually the wings are immaculate. The base of the wings, however, and the basal half of the costal margin of the front wings, are powdered more or less with dark scales, and the veins of the wings, especially on the lower side, are grayish. Expanse of wings one and seven-tenths inches to two inches.

This species occurs throughout Canada and the more north-

ern portions of the United States. It appears in many different forms; eleven named varieties are now recognized in the United States, and still other forms are known in Europe.

This polymorphism is partly seasonal and partly geographical. Thus, to illustrate a seasonal polymorphism, in the State of New York the butterflies emerging from pupæ that have passed the winter are of two distinct forms: first, *P. napi virginiensis*, which is smaller than the other, and with more delicate wings, which are always white below; and second, *P. napi oleracea*, a larger form, with stronger wings, which are usually tinged with yellow below. These two forms also differ in the remarkable fact that *oleracea* gives rise to other broods which appear later in the season, and are of a different form, while *virginiensis* is single-brooded. The summer broods, the offspring of *oleracea*, represent a third form, *P. napi cruciferarum*, which is larger than the spring form from which they have descended, with thinner wings, which are of a purer white on the upper side.

In the extreme North and in the far West other forms of this species occur which differ so greatly from our common forms that they were long considered as distinct species, but they have been shown to be merely geographical races.

CATERPILLAR.—Two-thirds of an inch long; body small cylindrical, and downy. In color it is green finely dotted with black except along the back.

Food-plants.—Cabbage, horse-radish, and other Cruciferæ.

Evidently this species has not concluded whether it will in its final form be all white; or have the front margins and tips of the front wings blackish; or have one spot on each front and

Plate XIV.

PLATE XIV

THE WHITES

Fig.

1–5. The Cabbage Butterfly, *Pieris rapæ;* 1, male, summer brood; 2, female, summer brood; 3, female, spring brood; 4, The Spotless Form, *Pieris rapæ immaculata;* 5, lower side of wings.

6–9. The Gray-veined White, *Pieris napi;* 6, lower side of wings; 7, The Summer Form, *Pieris napi cruciferarum;* 8, The Spring Form, *Pieris napi virginiensis;* 9, an individual with spotted wings.

Plate XIV.

hind wing; or have one black blotch along the wings outside the middle; or if it will have the veins of both wings above penciled with gray. All the varieties above mentioned occur; and to work out the history and different forms of the successive broods and of the several varieties requires a mind trained to mathematical precision in methods of thought. To one not thus trained this innocent white butterfly is a source of dire confusion, because its history is so intricate and it masquerades in so many guises. The caterpillar feeds upon the outer leaves of cabbage, eating holes in them rather than feeding along the margins. It resembles the caterpillar of *P. rapæ*, except that the dorsal stripe is indistinct and only marked by the absence of the black dots.

The species is essentially northern, but it spread far south when *Pieris rapæ* was introduced. In some way the European species has greatly reduced its numbers; it has literally taken to the woods as a result of this invasion and is seldom found elsewhere. In most of its varieties the gray-veined white is triple-brooded, and winters as a chrysalis.

The Cabbage Butterfly

Pieris rapæ (Pi'e-ris rapæ)

Plate XIV, Fig. 1–5; Plate III

Several varieties of this species are known, among which are the following:

(1) The Typical Form, *Pieris rapæ rapæ.*—The upper side of the wings is dull white, occasionally tinged with yellow, especially in the female; there is a grayish-black patch across the apex of the front wings, and a spot of the same color in cell M_3, also a similar spot on the costal margin of the hind wings; in the female there is a second spot on the front wings in cell Cu_2; on the under side the fore wings are white, with the apex yellow, and with two black spots in both sexes corresponding to the two on the upper side of the female; the hind wings are pale yellow, without marks, but sprinkled with dark scales. Expanse of wings about one and three-fourths inches.

The typical form is dimorphic; the spring brood, which come from wintering chrysalids, is composed of smaller butterflies, which are of a duller white than the summer butterflies and with smaller black markings on the middle and tip of the wings.

(2) The Sulphur Variety, *Pieris rapæ novangliæ.*—This form is characterized by having the ground color of the upper surface of the wings a uniform, delicate, canary yellow; the dusky markings are as in the typical form.

(3) The Spotless Form, *Pieris rapæ immaculata.*—This differs from the typical form in having no spots. It can be recognized by the yellowish tinge of the lower side of the hind wings, as in the typical form.

CATERPILLAR.—Length, about one inch. In shape it is cylindrical; its color is velvety green with a yellowish stripe down the back and on each side.

Food-plants.—Cabbage and other Cruciferæ.

If butterflies were in the habit of forming protective associations, some thirty years ago we would have heard of cabbage leaf petitions signed by various native Americans who were being supplanted by foreigners "plentiful and cheap." America had white cabbage butterflies of her own with most interesting and intricate histories; they were conservative in habits and did not appear in vulgar hordes, but took their toll quietly from all our cruciferous plants of the garden and especially from the cabbage. In 1860 the European cabbage butterfly was introduced at Quebec, and in 1868 it gained footing in New York. From these points has spread this importunate foreigner and, by appearing earlier in the season and having more broods a year, it has starved and driven out of American gardens the native cabbage butterflies; these have fled before the invader to the wilderness and there lead a precarious existence on wild Cruciferæ. Scarcely a quarter of a century had elapsed after this emigrant came to our shores before it had captured America from the Atlantic to the Pacific and from the Gulf of

Mexico to Hudson Bay. The only consolation the indignant American may experience when contemplating this invasion is to be derived from the fact that we gave the potato-beetle to Europe.

This is not a pretty butterfly ; if it had been we might have forgiven its presence, especially those of us not having our investments in the cabbage patch ; but its black-tipped and spotted white wings lend no color to the landscape. The only time we ever found it truly attractive was one day when we saw it flitting serenely down Broadway in New York city in nowise dismayed by the turmoil. If the caterpillars were neater in their habits we might see some beauty in them, for they are soft and velvety. However, what the butterflies and caterpillars lack in attractiveness is compensated for by the beauty of the egg. This is yellow in color and graceful in shape, and is ribbed lengthwise and crosswise in a most elaborate pattern. The chrysalis is also interesting in that it often takes on the color of the substance against which it is hung. Once upon a time we saw one of these hung against a pale-brown clapboard and another against a dark-brown window-casing not more than three feet distant, and each resembling the color against

which it was hung. The species is double-brooded in the far North and many-brooded in the South; it winters as a chrysalis. See PLATE III for early stages.

Far out at sea—the sun was high,
While veered the wind and flapped the sail;
We saw a snow-white butterfly
Dancing before the fitful gale,
Far out at sea.

. . . . . .

Above, there gleamed the boundless sky;
Beneath, the boundless ocean sheen;
Between them danced the butterfly.
The spirit-life of this vast scene,
Far out at sea.

R. H. THORNE.

THE ORANGE-TIPS

These, like the butterflies comprising the preceding group, are white, marked with black. Their most characteristic feature is the presence on the lower surface of the hind wings of a greenish network, or a marbled green mottling (Plate XIII, Fig. 8). This usually shows through the wing so as to appear as a dark shade when the wings are seen from above (Fig. 29). Many species have a conspicuous orange spot on the apical portion of the front wings. This has suggested the common name orange-tips for the group. But it should be remembered that some species lack this mark, and that in some others it is confined to the males. Nearly all of our species are confined to the far West.

In reference to the orange-tips, Mr. Scudder states that they are eminently butterflies of early spring, and what is remarkable is that they are usually single-brooded, mature rapidly, and by the end of June at latest in temperate regions, or earlier than that farther south, are already in the chrysalis, from which they do not emerge till the following season. In keeping with this their food is usually found to be those cruciferous plants of a similar habit, that is, which fruit early in the season, and then absolutely disappear from sight, dying down to the ground.

Nine species are found in the United States; the two following are the only ones that occur in the East.

The Falcate Orange-tip

Synchloe genutia (Syn'chlo-e ge-nu'ti-a)

Plate XV, Fig. 1, 2

In this species the apex of the fore wings is hooked, reminding one of the hook-tip moths. In the males there is a large apical orange-patch.

Caterpillar.—Length, four-fifths inch; head with papillæ on top; body slender and downy; color bluish green with a lighter stripe down the back and along each side. When examined closely it may be seen that the body-color is made up of fine stripes of various hues.

Food-plants.—Rock-cress, bitter cress, shepherd's-purse, Sisymbrium, and other Cruciferæ which are slender in form.

This rare little butterfly taught the junior author the meaning of falcate, that word having es-

caped her vocabulary until she made the acquaintance of this orange-tip. Never was a more charming definition than these graceful front wings with their brilliant curved tips. It seems to be the female of this species, as with the birds, that has the æsthetic taste to choose glowing colors in the raiment of her spouse; while he, "not noticing dress," is content that her white wings shall lack the orange-tips which make his beautiful. On the lower side of her wings as well as his is an intricate pattern wrought out in greenish yellow-brown and white. The species is found throughout the southeast United States not including Florida. It has been taken as far north as New Haven, Conn.

The Olympia Orange-tip

Synchloe olympia (Syn'chlo-e o-lym'pi-a)

Fig. 29; Plate XIII, Fig. 7, 8

In this species the orange patch is wanting in both sexes. There is a conspicuous black bar at the end of cell R + M of the fore wings, and the apical portion of these wings is gray, including a large irregular white band (Fig. 29).

Caterpillar.—Striped lengthwise with pale slate color and bright yellow; feet, legs, and head grayish green.

Food-plants.—Hedge-mustard and other Cruciferæ.

This species being an Olympian, it has apparently shared with the gods the privilege of inconsistency, for it is an orange-tip with the orange-tips left off. However, the under sides of the hind wings are spangled elaborately with brilliant yellowish green, so it is by no means a plain butterfly. There is a southern form called *rosa* which has a beautiful pink flush like the upper clouds at sunrise, spread over the under sides of the hind wings, making a rosy background for the spangles.

FIG. 29.—*Synchlœ olympia.*

THE YELLOWS

The yellows are easily recognized by their bright yellow colors, although in some species whitish forms occur. They abound almost everywhere in open fields, and are common about wet places in roads. To this group belong the larger number of our pierids.

Our more common species, which are described below, can be separated by the following table:

A. Antennæ with a distinct club, which is flattened, and is rounded at the apex.

B. Front wings with a black bar along the inner margin. (*N. iole*), p. 86. THE DAINTY SULPHUR.

BB. Front wings without a black bar along the inner margin.

C. Ground color of wings yellow. (*E. euterpe*), p. 98.
THE LITTLE SULPHUR.

CC. Ground color of wings orange. (*E. nicippe*), p. 97.
THE SLEEPY YELLOW.

AA. Antennæ gradually increasing in size toward the tip; the club ill-defined, slender, cylindrical, and terminating abruptly.

B. The outer margin of the upper surface of the front wings distinctly bordered with a dark-brown or black band.

C. Fore wings with a dog's-head figure. (*Z. cæsonia*), p. 90. THE DOG'S-HEAD.

CC. Fore wings without a dog's-head figure.

D. Colors normally yellow. (*E. philodice*), p. 92.
THE ROADSIDE BUTTERFLY.

DD. Colors normally orange. (*E. eurytheme*), p. 95.
THE ORANGE SULPHUR.

BB. The outer margin of the upper surface of the front wings not bordered with a brown or black band; sometimes, however, there is a series of dark spots on the outer margin.

C. Ground color of the upper surface of the wings canary-yellow.

D. Outer margin of hind wings with a broad orange band. (*C. philea*), p. 87.
THE RED-BARRED SULPHUR.

DD. Hind wings without broad orange band. (*C. eubule*), p. 88. THE CLOUDLESS SULPHUR.

CC. Ground color of wings orange or pinky-white. (*P. agarithe*), p. 90. THE LARGE ORANGE SULPHUR.

THE DAINTY SULPHUR

Nathalis iole (Na-tha'lis i'o-le)

PLATE XV, FIG. 4, 6

This little butterfly can be distinguished from all others described here by its small size, as it expands only from less than one inch to one and one-fifth inches. It is of a pale canary-yellow color, with dark-brown markings. There is a large apical patch on the fore wings, and a broad band parallel with the inner margin; on the hind wings there is a stripe on the basal two-thirds of the costa, and spots on the ends of the veins; these are more or less connected on the margin of the wing, especially in the female.

CATERPILLAR.—Length, one-half inch; body covered with stiff hairs; color, dark green with a broad purple stripe down the back and a double stripe of yellow and black along the side. The segment next to the head has a pair of cone-shaped bristly tubercles, reddish in color and projecting forward.

Food-plants.—The fetid marigold and garden marigold.

The dainty sulphur may have been called so just naturally by the first person who ever saw these little black and yellow beauties. In the case of the female the yellow deepens to orange, and she flits about on wings that show the livery of Lord Baltimore and emulate the brilliant color contrasts of the oriole. The species is at

PLATE XI

THE ORANGE-TIPS AND THE YELLOWS

Fig.

1. The Falcate Orange-tip, Synchloe genutia, male.
2. The Falcate Orange-tip, Synchloe genutia, female.
3. The Sleepy Yellow, Eurema mexicana, male.
4. The Dainty Sulphur, Nathalis iole, male.
5. The Sleepy Yellow, Eurema mexicana, female.
6. The Dainty Sulphur, Nathalis iole, female.
7. The Little Sulphur, Eurema euterpe, male.
8. The Little Sulphur, Eurema euterpe, female.
9. The Little Sulphur, the pale form, Eurema euterpe alba, male.
10. The Little Sulphur, the pale form, Eurema euterpe alba, female.

PLATE XV

THE ORANGE-TIPS AND THE YELLOWS

Fig.

1. The Falcate Orange-tip, *Synchlæ genutia*, male.
2. The Falcate Orange-tip, *Synchlæ genutia*, female.
3. The Sleepy Yellow, *Eurema nicippe*, male.
4. The Dainty Sulphur, *Nathalis iole*, male.
5. The Sleepy Yellow, *Eurema nicippe*, female.
6. The Dainty Sulphur, *Nathalis iole*, female.
7. The Little Sulphur, *Eurema euterpe*, male.
8. The Little Sulphur, *Eurema euterpe*, female.
9. The Little Sulphur, the pale form, *Eurema euterpe alba*, male.
10. The Little Sulphur, the pale form, *Eurema euterpe alba*, female

Plate XV.

home in the southwest United States and Mexico, and is found in the Colorado Mountains at the height of eight thousand feet. However, it has not yet adapted itself sufficiently to the climatic condition of Colorado to belong to the successful of that great State; for very often the first frosts kill the food-plant when the caterpillars of the last brood are not more than half grown and they die the ignoble death of the great unfit; and for two years thereafter no more dainty sulphurs gladden that region.

"Those old days when the balancing of a yellow butterfly over a thistle bloom was spiritual food and lodging for a whole forenoon." LOWELL.

THE RED-BARRED SULPHUR

Callidryas philea (Cal-lid'ry-as phil'e-a)

PLATE XVI, FIG. 1

This is the largest of all the yellows found in the eastern United States, the wings expanding from three inches to nearly four inches. The wings are bright yellow above with a large orange patch in the male crossing cell R + M of the front wings somewhat beyond the middle of the cell; and with the outer margin of the hind wings orange in both sexes. In the female there is a row of dark-brown spots along the outer third of the costa of the front wings and along the outer margin of both wings; and on the fore wings there is a submarginal row of nine spots in cells R_1 to Cu_1.

This is a tropical species that invades the United States in Texas, and occasionally flies northward to the Mississippi Valley.

The Cloudless Sulphur

Callidryas eubule (Cal-lid'ry-as eu-bu'le)

Plate XVI, Fig. 3, 4

This large butterfly expands two and one-half inches. The wings above are of uniform bright canary-yellow. In the male they are without spots, except frequently an inconspicuous brown dot at the tip of each vein, and a lilac-brown edging of the costal border. In the female there is a discal dot on fore wings and a marginal row of brown spots at the ends of the veins.

Caterpillar.—Length, one and two-thirds inches; color, pale yellowish green with a yellow band along each side. The segments are dotted with black in crosswise rows.

Food-plants.—Cassia and other legumes.

Thus says that classic book, Smith and Abbot (1797), opposite the page whereon the cloudless sulphur is depicted in all its canary-colored glory near a flowering branch of cassia: "It is curious to obſerve the conformity of colours between the flowers of this plant and the fly bred upon it. We ſhall have occaſion to note other inſtances of the ſame kind, and there are many of them throughout nature. In ſome caſes thoſe reſemblances ſeem to anſwer the purpoſe of protection; as

PLATE XVI

THE LARGER YELLOWS

Fig

1. The Red-barred Sulphur, Callidryas philea, male.
2. The Large Orange-sulphur, Phoebis agarithe, male.
3. The Cloudless Sulphur, Callidryas eubule, male.
4. The Cloudless Sulphur, Callidryas eubule, female.

Valley.

The Cloudless Sulphur

Callidryas eubule (Cal-lid'ry-as eu-bu'le)

Plate XVI, Fig. 3, 4

wings above are of uniform bright canary-yellow. In the male

PLATE XVI

THE LARGER YELLOWS

Fig.

1. The Red-barred Sulphur, *Callidryas philea*, male.
2. The Large Orange-sulphur, *Phœbis agarithe*, male.
3. The Cloudless Sulphur, *Callidryas eubule*, male.
4. The Cloudless Sulphur, *Callidryas eubule*, female.

of the discal border. In the female there is a discal dot on

segments are dotted with black in crosswise rows.

Food-plants.—Cassia and other legumes.

Plate XVI.

when a chryſalis reſembles the bark to which it is fixed; or a caterpillar the flower or leaf it feeds upon; but that purpoſe ſeems not to be anſwered here. Do ſuch ſimilarities of appearance, in ſerving to exerciſe the attention and powers of diſcrimination of animals deſtined to devour the fly, or of others that feed upon the flower, thus increaſe the general ſum of happineſs in consequence of the employment of intellect and the ſucceſs of its exertion?"

The cloudless sulphur is most socially inclined, congregating in great numbers on flowers and forming a moving mass of brilliant yellow under the rays of the hottest, brightest sunshine. But the most interesting of its habits is that of migrating in flocks from southeast to northwest in the spring and from northwest to southeast in the autumn. A stream of them "six or eight yards wide and about as many high" was once observed near Charleston. Another record in Georgia mentions "a half a dozen visible all the time pursuing an undeviating course, flying over and not around houses and obstructions." Another observer has witnessed the autumn migration for twenty-six consecutive years.

The species is double-brooded, and is usually abundant in the Southern States and migrates

each season up the coast to New England and up the Mississippi Valley to Wisconsin. The chrysalis has a very peculiar form, being concave in the back, and having the wing cases fan-shaped so that it looks like a fading flower of the cassia attached to the branch. The male butterfly has a perfume which Miss Murtfeldt describes as resembling that of violets.

The Large Orange-sulphur

Phœbis agarithe (Phœ'bis a-gar'i-the)

Plate XVI, Fig. 2

This differs from the two preceding species, which it resembles in size, in that the ground color of the wings is orange. The figure on the plate represents the male; the female has generally golden orange, sometimes pinky-white, fore wings with a diffused orange patch over the end of cell R + M, and a brown spot at the end of this cell. Expanse of wings two and one-half to two and three-fourths inches.

This species is found in the southern portion of the Mississippi Valley and southward. The larva feeds upon cassia.

The Dog's-head

Zerene cæsonia (Ze-re'ne cæ-so'ni-a)

Plate XVII, Fig. 5, 6

The wings are lemon-yellow above, bordered on the outer margin with black. On the hind wings the border is narrow,

but on the fore wings suggests a head of a dog or of a duck, a prominent black spot on the medial vein serving as the eye.

CATERPILLAR.—Length about three-fourths inch; its color is light or dark yellowish green; usually there are cross stripes of black or yellow, and each segment bears a cross row of papillæ, usually black.

Food-plants.—Lead-plant or false indigo and clover.

It is certainly a new species of dog that is delineated in yellow against black on the wings of this butterfly. It looks far more like a duck with bill opened in the act of quacking than it does like a dog. However, it is a very alert-looking creature whether it be bird or beast. A large black eye adds much to its vivacious expression of countenance.

The dog's-head is abundant in the southwestern United States and extends to the Pacific and into Central America. It is sometimes found as far north as Pennsylvania, Kansas, and Wisconsin. In its northern range it is three-brooded, and winters as a chrysalis. It loves to settle on the red-purple blossoms of the thistle, clover, and the milkweed; and as if in sympathy with the color of these flowers, the females of the late broods have the veins of the hind wings outlined in reddish purple. It is said that this butterfly is fond of the open pine woods, and has habits

similar to those of our roadside butterfly, and that it congregates in large numbers on damp spots in roads and fields.

Its food-plant is largely *Amorpha fructiosa*, called sometimes lead-plant because of the superstition prevalent that wherever it occurs lead is to be found; whereas the truth is, wherever it is found there also are golden butterflies.

The Roadside Butterfly or the Clouded Sulphur

Eurymus philodice (Eu'ry-mus phi-lod'i-ce)

Plate XVII, Fig. 1–3

The wings above are rather pale greenish yellow, with the outer borders blackish brown; the border is broader on the front wings of the female than on those of the male, and contains a submarginal row of yellow spots which are absent in the male; the discal dot of the front wings is black, that of the hind wings is orange, usually with a smaller accompanying dot. The antennæ, the costal margin of the fore wings, the fringes of the wings, and the hairs on the pronotum are pink. The wings below vary from a rather pale to a rather deep sulphur yellow and are flecked more or less with brown scales; the discal spots are silvery in the center; that of the front wings is black, that of the hind wings brown, surrounded by a pinkish brown ring; there is a submarginal row of dots; the three in cells, M_3, Cu_1, and Cu_2 of the front wings are usually black, the others brown or pinkish; there is a pink spot at the base of the hind wings. The wings ex-

our roadside butterfly, and
in large numbers on damp
fields.

plant is largely *Amorpha fructiosa*,
weed-plant because of the super-
tion prevalent that wherever it occurs lead is
to be found; whereas the truth is, wherever it is
found there also are golden butterflies.

PLATE XVII

THE ROADSIDE BUTTERFLY OR THE CLOUDED SULPHUR

THE YELLOWS

Fig. *Eurymus philodice* (Eu'ry-mus phi-lod'i-ce)

1. The Roadside Butterfly, *Eurymus philodice*, male.
2. The Roadside Butterfly, *Eurymus philodice*, female.
3. The Roadside Butterfly, *Eurymus philodice*, female, the white form.
4. The Orange Sulphur, *Eurymus eurytheme*, male.
5. The Dog's-head, *Zerene cæsonia*, male.
6. The Dog's-head, *Zerene cæsonia*, female.

tains a submarginal row of yellow spots which are absent in

the hind wings is orange, usually with a smaller accompany-

the fringes of the wings, and the hairs on the pronotum are pink. The wings below vary from a rather pale to a rather deep sulphur yellow and are flecked more or less with brown scales; the discal spots are silvery in the center; that of the front wings is black, that of the hind wings brown, surrounded by a pinkish or red ring; there is a submarginal row of dots, the three in cell M_3, Cu_1, and Cu_2 of the front wings are usually black, the others brown or pinkish; there is a pink spot at the base of the hind wings. The wings ex-

Plate XVII.

pand from one and three-fourths inches to two and one-half inches.

The females are dimorphic, there being a form in which the ground color of the wings is white instead of yellow (Plate XVII, Fig. 3).

CATERPILLAR.—Length slightly more than an inch; body downy and green in color with faint stripe down the back and a pale pinkish stripe along the side, which has a black border below; or the body may be pale yellowish along the sides.

Food-plants.—Clover, vetch, lupine, etc.

With the words "yellow butterfly" there always comes to the mind a vision of this species, it being familiar to us all who live in the eastern United States. It hovers over flowers of the field, especially loving the yellow blooms; but more than all this, it loves to hold banquets around the mud-puddles in the road. Almost any time in August when driving along a country highway we may see at a distance in front of us a shining yellow blotch which scatters on our approach into a hundred yellow butterfly fragments; and if we afterward examine the spot closely we can see the mud perforated with "pinholes" where these thirsty creatures have thrust their long tongues. The roadside butterfly is inquisitive, always wanting to know what is going on; it is a jolly comrade, playing with its mate

in the air, where it enters into many fluttering matches which need no umpires. It loves the brilliant sunshine; let a heavy cloud obscure the sun of a summer's day and a field that seemed full of butterflies suddenly shows not one; for to them the cloud is a sign that it is time to hide beneath clover, or down in the grasses, in which places they pass the night.

In this species some of the females are white and are often mistaken for the cabbage butterfly. Though we all have had such a long acquaintance with the roadside butterfly, I wonder how many of us ever saw its little green caterpillar on the clover. Little wonder that this is so, for the small chap is well hidden, clinging to the midrib of the leaf or to the stalk, which it resembles very closely, and at a touch will drop to the ground. There are three broods, and it is supposed that the winter is passed in the caterpillar stage.

This species occurs from the mouth of the St. Lawrence to South Carolina and westward to the Rocky Mountains.

From dewy lanes at morning
The grapes' sweet odors rise;
At noon the roads all flutter
With yellow butterflies.

HELEN HUNT.

The Orange Sulphur

Eurymus eurytheme (Eu'ry-mus eu-ryth'e-me)

Plate XVII, Fig. 4

This species closely resembles philodice in size, shape, and markings. The typical form differs from philodice in being of an orange color instead of yellow above; the costal margin of both wings and the inner margin of the hind wings are, however, yellow. Except in this difference in the ground color of the wings, the description of the clouded sulphur given above will apply quite closely to the more common form of this species.

This is one of the most polymorphic of all butterflies, and the forms differ so much that they have been described several times as distinct species. The typical form described above is the only one occurring in the East.

Caterpillar.—Length nearly one and one-fourth inches. Color grass-green, with an indistinct line down the back. Along each side of the back is a white stripe on which are irregular patches of vermillion or orange yellow; at the center of each segment below the stripe are darker markings.

Food-plants.—Clover, buffalo-clover in the West, milk-vetch, lupines and pea-vines.

This orange imitation of the clouded sulphur appears in many forms, each succeeding brood of the year being a different shade of yellow from the others, except in the far South, where it seems to have reached its limit in depth of color after the third brood. In some of the later broods

part of the females are pale, looking distinctly anæmic when compared with their brilliant sisters. The orange sulphur has had to adapt itself to various conditions. It has to summer in Texas, where its food-plant occurs only during the fall and winter; and it has to winter in the north, after the food-plant is frozen. It has been a source of great entertainment to the entomologists of the past who were species hunters, and they have described its different forms as distinct species. The records show that it has the following baptismal names: eurytheme, chrysotheme, hagenii, eriphyle, edusa, barbara, harfordii, keewaydin, ariadne, amphidusa and others. It can be seen from the above that this butterfly, which looks like a California poppy blown off the stem, can compete successfully in names with any of the crowned heads of Europe.

The species is most abundant in the Mississippi Valley; but it is found on the Pacific coast and also along the Atlantic coast as far as Maine. It is very much like the roadside butterfly in its habits, being an active flyer and social in its disposition.

This insect is from two- to four-brooded, depending on the locality; and it winters in both the adult and larval states.

The Sleepy Yellow

Eurema nicippe (Eu-re'ma ni-cip'pe)

Plate XV, Fig. 3, 5

The wings above are bright orange, marked with blackish brown as follows: on the fore wings a narrow bar at the apex of the discal cell, the apical portion of the wings, and the outer margin; on the hind wings, the outer margin. In the female the outer marginal band is interrupted at the anal angle of each wing, and on the hind wings it may be reduced to an apical patch. The expanse of wings is from one and six-tenths inches to one and nine-tenths inches.

Caterpillar.—One inch in length; body, slender and downy; color green, with a white stripe along the side marked with yellow and bordered below with blackish.

Food-plants.—Cassia, clover, senna.

The black spots which decorate the middle of the front wings of the yellows are reduced in this species to narrow, transverse lines, which look like eyes almost closed; because of this feature our name for this butterfly has always been the sleepy yellow. The common popular name that has been applied to it, the "black-bordered yellow," is not very distinctive in a family which particularly affects black borders. The male is a bright orange, while his wife is of a paler hue. The lower side of the front wings is a brilliant orange yellow at the base, fading near the edges and looking like the western sky after sunset.

The sleepy yellow loves society, and flocks over the clover fields and upon forest-bordered meadows; when gathered in numbers on the moist earth they look like a patch of brilliant sunlight. It is a southern species extending from the Atlantic to the Pacific. Sometimes it appears as far north as New York, Ontario, and Wisconsin.

The caterpillars eat the tips of the cassia leaves at first. There are three distinct broods and probably more, as Mr. Edwards found in September in West Virginia a branch of senna on which was every stage of this butterfly, from the egg to the newly emerged adult.

Thou spark of life, that wavest wings of gold!
Thou songless wanderer 'mid the songful birds,
With nature's secrets in thy tints unrolled
Through gorgeous cipher, past the reach of words,
Yet dear to every child
In glad pursuit beguiled,
Living his unspoiled days 'mid flowers and flocks and herds.

HIGGINSON.

THE LITTLE SULPHUR

Eurema euterpe (Eu-re'ma eu-ter'pe)

PLATE XV, FIG. 7, 8, 9, 10

Although this species is larger than the dainty sulphur, it is considerably below the average size of our yellows, the larger

specimens expanding less than one and one-half inches. The wings are canary-yellow above, with the apex of the fore wings and the outer margin of both fore and hind wings blackish brown. The border of the hind wings is narrow and is sometimes wanting.

There is a pale variety of the species, *Eurema euterpe alba;* this is represented by Figures 9 and 10 of the Plate.

CATERPILLAR.—Three-fourths of an inch long; body, downy; color grass-green, with one or two white lines along each side.

Food-plants.—Cassia and other legumes, preferring the species with finely divided leaves.

This is a pocket edition of the roadside butterfly, except that the black spot in the middle of the front wing is reduced to a mere dot. Yet though so small and fragile and with "flight timid and feeble," it has taken possession of a large portion of the United States; it is found in the South from the Atlantic to the Pacific, and it has even gained a foothold in southern New England and northern Ohio and Wisconsin. More than this, there are on record two instances where it invaded the Bermudas, flying with the wind the six hundred miles from the mainland. The Bermudans saw one day a "cloud coming from the northwest"; but when the cloud came nearer it resolved itself into "an immense concourse of

small, yellow butterflies which flitted about the open grassy patches in a lazy manner as if fatigued with their long journey over the deep." It is to be feared that the little voyagers found them inhospitable islands, for there is no record that this species flourishes there to any great extent.

The little sulphur is a social midget and makes glad the open grass places with its numerous flittings, or gathers in bright patches in large family reunions around the festal mud-puddle; if such a gathering be observed in the South there may be found in it many of the pale wives; for this species, like the roadside butterfly, has some white females. The caterpillar hides itself cunningly on the cassia leaf by stretching itself along a midrib when it is not eating, and in this position, because of its form and color, it is practically invisible. But if roughly disturbed it swings off on a thread of silk, a performance quite unusual for a butterfly caterpillar. The species is at least three-brooded in its southern range.

Thy citron-yellow wings are bright,
And soft the rosy fringe they wear,
And rays of gloom and silver bright
Adorn thee, blossom of the air!

The Cassia, on whose silken flower
Thy fragile life its being fills,
What hast thou garnered of its dower
To waft thee where thy spirit wills?

LAURA F. HINSDALE.

FAMILY III

THE NYMPHS

Family Nymphalidæ (Nym-phal'i-dæ)

The family Nymphalidæ, or Nymphs, includes chiefly butterflies of medium or large size; but a few of the species are small.

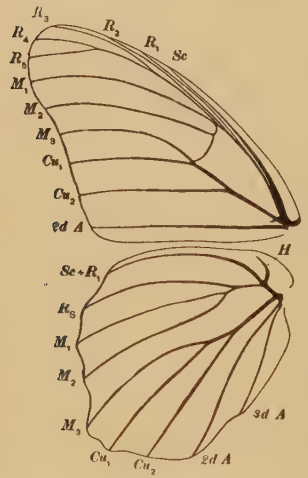


FIG. 30.—Venation of the wings of *Basilarchia astyanax*.

This family is the first of a series of four families in which the front legs are very greatly reduced in size *in both sexes*. So great is the reduction that these legs cannot be used for walking, but are folded on the breast like a tippet.

The nymphs can be distinguished from the other three families of four-footed butterflies as follows: the veins of the fore wings are not greatly swollen at the base as in the meadow-browns; the fore wings are not so long and narrow as in the heliconians; and the antennæ do not appear to be naked as in the milkweed butterflies.

The venation of the wings of a characteristic species is shown in Figure 30.

The larvæ are nearly or quite cylindrical, and are clothed to a greater or less extent with hairs and sometimes with branching spines.

The chrysalids are usually angular, and often bear large projecting prominences; sometimes they are rounded. They always hang head downward, supported only by the tail, which is fastened to a button of silk. (Plate II, Fig. 2.)

This is the largest of the families of butterflies. It not only surpasses the other families in number of species, but it contains a greater number and variety of striking forms, and also a larger proportion of the species of butterflies familiar to every observer of insects. There may be in any locality one or two species of yellows or of whites more abundant, but the larger number of species commonly observed are nymphs.

In order to facilitate the study of the family our genera have been separated into five groups, which are known respectively as the Fritillaries, the Crescent-spots, the Angle-wings, the Sovereigns, and the Emperors.

The structural features distinguishing these groups are in some cases difficult to observe, and consequently are not available here; but by means of the following somewhat artificial table, our Eastern species can be placed in their proper groups:

A. Eyes hairy, p. 131. THE ANGLE-WINGS (in part).

AA. Eyes naked.

B. Club of the antennæ long and slender, increasing in size gradually, as a rule hardly more than twice as broad as the stalk.

C. Hind wings with tail-like prolongations (the Goat-weed Butterfly), p. 173. THE EMPERORS (in part).

CC. Hind wings not tailed.

D. With a row of eye-spots near the outer margin of the upper surface of the hind wings, p. 173.

THE EMPERORS (in part).

DD. Wings without eye-spots, p. 162.

THE SOVEREIGNS.

BB. Club of antennæ short, more or less abruptly thickened.

C. Lower surface of the wings with silvery spots, p. 104.

THE FRITILLARIES (in part).

CC. Lower surface of wings without silvery spots.

D. With two large eye-spots on the upper surface of each hind wing (the Buckeye), p. 131.

THE ANGLE-WINGS (in part).

DD. With several eye-spots or with none on the upper surface of the hind wings.

E. Palpi with the last segment extremely short, p. 104. THE FRITILLARIES (in part).

EE. Palpi with the last segment from one-half to one-third as long as the preceding segment, p. 123.

THE CRESCENT-SPOTS.

THE FRITILLARIES

The fritillaries are butterflies varying from a little below to somewhat above medium size. The club of the antennæ is short and broad; and, as in the crescent-spots, it is marked beneath with a single elevated line or with none. The palpi

are large and bushy, the last segment extremely short. The color of the wings is fulvous bordered and checkered with black; but not so heavily bordered as in the crescent spots. The lower surface of the hind wings is often marked with curving rows of silvery spots. This is a large group containing many species, which are extremely difficult to separate.

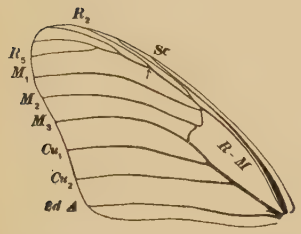


FIG. 31.—Fore wing of *Agraulis vanillæ*.

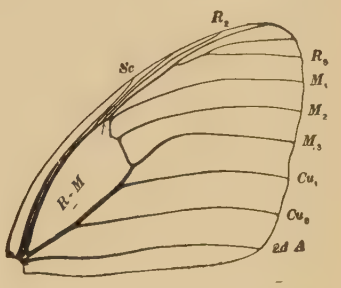


FIG. 32.—Fore wing of *Argynnis cybele*.

More than fifty species occur in America north of Mexico. The larvæ feed upon the leaves of violets.

The more common species, which are described below, can be separated by the following table:

A. Vein R_2 of the fore wings arising beyond the apex of cell R+M (Fig. 31).

B. Fore wings with the apex produced, making the outer margin concave (Fig. 33).

C. Lower side of wings marked with silvery spots. (*A. vanillæ*), p. 107. THE GULF FRITILLARY.

CC. Lower side of wings without silvery spots. (*E. claudia*), p. 109. THE VARIEGATED FRITILLARY.

BB. Fore wings with the apex not produced, the outer margin being convex throughout (*Brenthis*).

C. Lower side of hind wings with silvery spots. (*B. myrina*), p. 122. THE SILVER-BORDERED FRITILLARY.

CC. Lower side of hind wings without silvery spots. (*B. bellona*), p. 119. THE MEADOW FRITILLARY.

AA. Vein R_2 of the fore wings arising before the apex of cell R+M (Fig. 32).

B. Basal half of upper surface both pairs of wings blackish brown or greenish black without spots on this part. (*S. diana*), p. 110. THE DIANA FRITILLARY.

BB. Basal half of the fore wings at least with spots.

C. Fore wings fulvous, hind wings black. (*S. idalia*), p. 112. THE REGAL FRITILLARY.

CC. Both wings fulvous (*Argynnis*).

D. The buff submarginal belt between the two outer rows of silvery spots on the lower surface of the hind wings broad.

E. With the outer-marginal and submarginal lines of the upper surface of the wings separated by a series of quadrangular fulvous bars, except sometimes near the apex of the fore wings of females; a larger species expanding from three to three and one-half inches. (*A. cybele*), p. 114. THE GREAT SPANGLED FRITILLARY.

EE. With the outer-marginal and submarginal lines of the upper surface of the wings united into a common black band throughout a considerable part of their length, the quadrangular bars being

obsolete or much less developed than in the great spangled fritillary; a smaller species expanding from two to two and one-half inches. (*A. atlantis*), p. 118. THE MOUNTAIN SILVER-SPOT.

DD. The buff submarginal belt between the two outer rows of silvery spots on the outer surface of the hind wings narrow or wanting, being greatly encroached upon by the ground color. (*A. aphrodite*), p. 117. THE SILVER-SPOT FRITILLARY.

THE GULF FRITILLARY

Agraulis vanillæ (A-grau'lis va-nil'læ)

PLATE XVIII, FIG. 1, 2

Wings reddish fulvous above; the veins of the front wings are black on the outer two-thirds of the wing; the black expands into spots at the end of veins M_3 to anal; there are two white spots in cell R + M and one on the medial cross-vein each surrounded by black; cells M_3, Cu_1 and Cu_2 each contains a round black spot. The outer margin of the hind wings has a broad black border, which contains a fulvous spot in each cell; there is a black spot at the base of cell M_3, and one in cell R_5. The under surface of the wings is marked with many large silvery spots; of which there are about ten near the apex of the front wings, three or four in cell R + M of the same wings, and about twenty-four on each hind wing. Expanse of wings two and one-fourth inches to three inches.

CATERPILLAR.—In addition to the six rows of thorny spines, which characterize the caterpillars of many other fritillaries, this one has on the head a pair of backward bend-

ing spines branched like the others. The ground color of the body is yellowish or pale brown, with two dark stripes along each side and usually a more or less dark stripe along the back. The spiracles are marked with orange.

Food-plants.—Various species of passion-flowers.

On wings that are longer and more slender than those of other fritillaries does this one flit above the flowery fields of the Gulf States. It comes as far north as southern Virginia ; and the Pacific Ocean only limits its southward range in the West.

In ground color it resembles the monarch more than it does the fritillaries. It is true that it bears the silver beneath the hind wings, but this is in the form of bars rather than coin. The brilliant glittering orange red of the upper surface of the wings makes it a fit companion for subtropical flowers. When one sees this bit of animated sunshine one involuntarily wonders whether the earlier stage spent in consuming the leaves of the passion-flower has aught to do with the ardent color of the butterfly. But this is idle speculation rather than natural history.

The species occurs from New Jersey and Pennsylvania southward, also in Arizona and California.

Plate XVII.

PLATE XVIII

FRITILLARIES

Fig.

1. The Gulf Fritillary, *Agraulis vanillæ.*
2. The Gulf Fritillary, *Agraulis vanillæ,* lower side of wings.
3. The Variegated Fritillary, *Euptoieta claudia,* lower side of wings.
4. The Variegated Fritillary, *Euptoieta claudia.*

Plate XVIII

The Variegated Fritillary

Euptoieta claudia (Eup-toi-e'ta clau'di-a)

Fig. 33; and Plate XVIII, Fig. 3, 4

This species agrees with the preceding in having the apex of the fore wings produced so that the outer margin is concave; but differs in lacking silvery spots on the lower surface. The wings are fulvous; both pairs are crossed by a common paler band, and marked with black and blackish fuscous. The under surface of the wings is beautifully marbled with brown and whitish.

Caterpillar.—Length one and one-fourth inches. The body is orange red with two dark stripes extending along each side enclosing whitish blotches, which taken together make an interrupted whitish band along the side. There are six rows of thorny spines on the body; the top pair on the first segment point forward over the head.

Food-plants.—Passion-flower, mandrake, stone crop, tick foil, portulacca, violet.

Not only with a mosaic of blossoming weed does Nature deck her waste places; lest the flowers fade she scatters there many-hued butterflies; and by these as well as the blossoms she tells us plainly that she has no

Fig. 33.—The variegated fritillary

waste places where she has at hand water-power and sunshine-power to help her manufacture life and color. Above such lands neglected by man, the variegated fritillary hovers on golden red wings or rests basking in the sun on the sands of drought-wasted streams. It is a true recluse in habits, for at the sound of an approaching footstep it rises in the air and executes some acrobatic feats in flight that the untrained eye is quite unable to follow and then suddenly disappears entirely. Its color has more of sunshine than is on the wings of preceding species. Its caterpillar feeds stealthily by night on the mysterious passion-flower. The rapid flight of the butterfly is equaled relatively by the rapidity which characterizes the traveling of the caterpillar.

The species is apparently triple-brooded in some localities, and occurs throughout the United States east of the Rocky Mountains, but is very rare in the northern half of this region.

The Diana Fritillary

Semnopsyche diana (Sem-nop-sy'che di-a'na)

Plate XIX, Fig. 1, 2

This butterfly is remarkable for the great difference in coloring of the two sexes. In the *male* the basal three-fifths of the upper surface of each wing is dark velvety brown, the

PLATE XIX

THE DIANA FRITILLARY

Fig.
1. Semnopsyche diana, male.
2. Semnopsyche diana, female.

PLATE XIX

THE DIANA FRITILLARY

Fig.

1. *Semnopsyche diana*, male.
2. *Semnopsyche diana*, female.

Plate XIX.

outer two-fifths deep orange. The veins on the orange portion are more or less shaded with brown, and this part of the wing is crossed by two series of brown spots. In the *female* the upper surface of the wings is blue or green-black; the outer third of the fore wings is crossed by three rows of blue or whitish spots; the outer third of the hind wings is dark metallic blue or green interrupted on the veins by the ground color, and with marginal and submarginal bands, and a series of spots near the base of this third, all of the ground color. The male expands three and three-fourths inches; the female a little over four inches.

CATERPILLAR.—Black and velvety. The barbed spines are fleshy and orange-colored at their base, and arranged in six longitudinal rows. The head is brownish.

Food-plant.—Violets.

This is one of the largest and most beautiful species of fritillaries; and when one sees both sexes the resemblance between them is so slight that one wonders how they have sufficient acumen to select each other. It is true their wings are of the same "cut," and the silver crescents mark the outer edge of the under side of the hind wings of both, and both are attired in textures of velvet. But beyond these slight resemblances they are so different in color and markings that no one would guess they belonged to the same species, unless he had knowledge of their habits. Even the colors of the under side of the wings are different. The

gorgeous orange and seal-brown wings of the male disport a lining of buff, while the black and metallic-blue wings of the female have a lining of sober grayish brown, decorated on the fore wings with blue and black patches. The chrysalis is grayish brown with projections on the back that are of lighter hue. It is certainly a very ordinary looking case to hold such an extraordinary butterfly.

The species is single-brooded, and occurs in "the hilly country of the South, following the Alleghanies, and a comparatively narrow belt westward at about the 38th parallel of latitude." (Scudder.)

The Regal Fritillary

Speyeria idalia (Spey-er'i-a i-da'li-a)

Plate XX, Fig. 1, 2

This species can be distinguished from our other fritillaries by its having the fore wings fulvous and the hind wings black. The sexes differ somewhat in markings. In the *male*, the upper surface of the fore wings is marked with black spots and bars arranged as in typical fritillaries. The black markings, however, are less prominent, except that there is a distinct black band on the outer margin as in the mountain silver-spot. The hind wings are black, with violet reflections ; the base of the wings is tinged with fulvous. There is a black spot in the cell R + M, a transverse row of yellowish spots

1. Spheyeria idalia, male.
2. Spheyeria idalia, female.

PLATE XX

THE REGAL FRITILLARY

Fig.

1. *Speyeria idalia*, male.
2. *Speyeria idalia*, female.

The Regal Fritillary

Speyeria idalia (Spey-er'i-a i-da'li-a)

Plate XX, Fig. 1, 2

Plate XX.

beyond the cell, and a submarginal row of fulvous spots. In the *female* the outer marginal band of the fore wings is broader; it contains a row of white spots, and there are six additional white spots near the apex; on the hind wings the outer row of spots is of the same color as the inner. Beneath in both sexes the fore wings are orange and the hind wings a rich olive brown, with nearly thirty large silvery white spots. Expanse three and one-half to four inches.

CATERPILLAR.—Length one and three fourths inches. Velvety black in color with dull yellow or reddish stripes. It bears six rows of thorny spines, which are fleshy at the base. The spines along the back are silvery or yellowish white tipped with black. Sometimes the bases of the spines along the sides are orange.

Food-plant.—Violets.

This butterfly has honestly earned its name, for it is truly a regal creature. Its broad large wings are beautifully and richly colored above with velvety orange and blue-black.

The silvery spots beneath the wings are tinged with green and are angular in shape; and set against an olive background, they shine like the bangles against the dark breast of some Oriental beauty. Even its flight is characterized by the dignity and deliberation of a royal personage, and its favorite resting-place is on a goldenrod throne. It seems somewhat capricious as to the localities it frequents, often being quite abundant in one

place and not to be found a few miles distant, even though the physical features of the two places are similar.

The caterpillar hatches from the egg in the autumn and winters in its first stage. It feeds by night, and Mr. Scudder thinks it is likely to have another food-plant than violets.

The species is single-brooded, and occurs from Maine to Delaware and westward to Nebraska and Arkansas.

The Great Spangled Fritillary

Argynnis cybele (Ar-gyn'nis cyb'e-le)

Plate XXI, Fig. 1, 2

There occur in the eastern United States three species of the larger Fritillaries, representing the genus Argynnis, which can be separated at a glance from their allies occurring in this fauna, but which so closely agree in color and in markings that it is with difficulty that they can be distinguished from each other. These are represented on Plate XXI ; and the distinctive characteristics are given in the table above.

The males of these insects can be distinguished by a fringe of long hairs in the basal two-thirds of cell R_1 of the hind wings.

Caterpillar.—Length one and three-fourths inches. Black more or less velvety, bearing on each side the characteristic three rows of black thorny spines which in this case are polished ; the base of these spines may be orange. Its habits are nocturnal.

Food-plant.—Any species of violet.

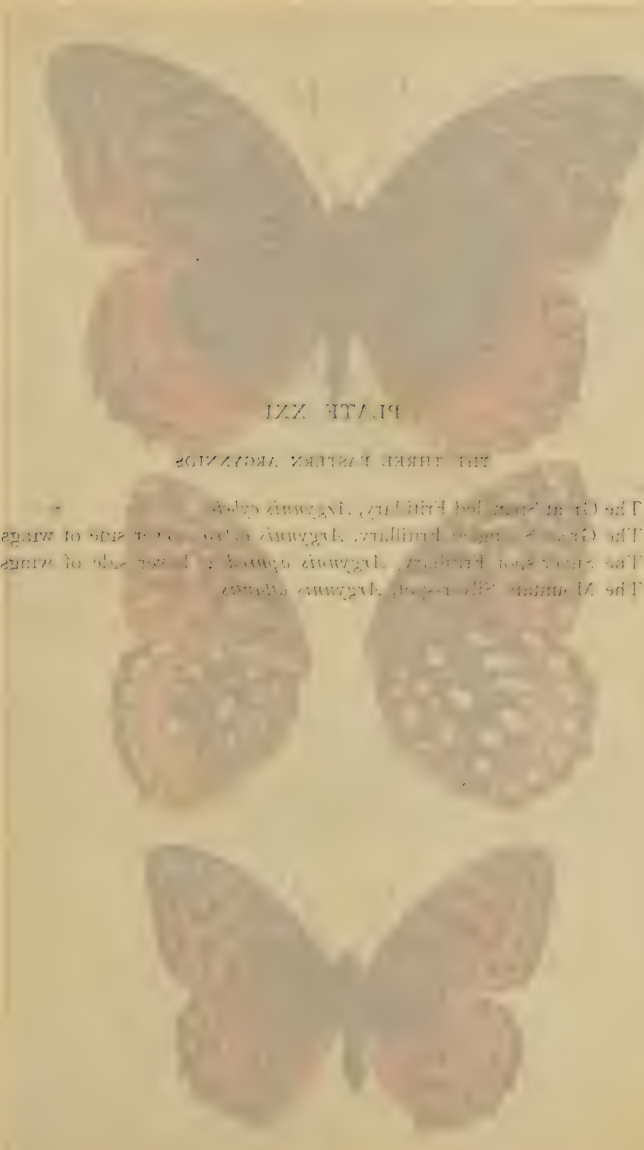


PLATE XXI

THE THREE EASTERN ARGYNNIDS

Fig.

1. The Great Spangled Fritillary, *Argynnis cybele*.
2. The Great Spangled Fritillary, *Argynnis cybele*, lower side of wings.
3. The Silver-spot Fritillary, *Argynnis aphrodite*, lower side of wings.
4. The Mountain Silver-spot, *Argynnis atlantis*.

Plate XXI.

When we were children a familiar sight to us on our journeys to and from school were certain large round-winged tawny butterflies settling themselves as best they could on the thistle blossoms. When finally engaged in exhausting the sweets offered at this roadside restaurant, their wings were lifted and closed and we saw on their lower sides what we called "butterfly money." This currency was of various denominations, and near the edges were what we called "dollars" broken in halves and set in a row, a fact which puzzled us until we discovered the lost halves set in a row on the opposite wing; a charming lesson in short division this. Some of these butterflies were much larger than others, and we never doubted that the smaller ones were not yet grown up. It had never been revealed to us that butterflies cease growing when they attain their wings. The largest of these butterflies that carried their wealth under their wings were undoubtedly great spangled fritillaries; and the smaller ones were silver-spots. We never saw that buff band just inside the "coins" along the edge of the lower side of the hind wings which is as wide in its narrowest place on the great spangled species as is the diameter of the largest "dollar" on the wing; and which in the silver-spot

is narrower decidedly than the width of the largest "coin." The great spangled varies so in size that specimens of it are often not larger than the silver-spot, so this wide buff band is the only thing that distinguishes the species.

The history of the great spangled caterpillar is an interesting one. It hatches from the egg in the fall as a tiny olive caterpillar; it may take a bite or two of the egg-shell, but never another mouthful; with this scanty breakfast to sustain it it meets the rigors of winter. It lies dormant until spring melts its coverlet of frost and snow and spreads an early banquet of new violet leaves for this fasting baby. It is always a shy insect, feeding only during the night and hiding by day; it changes to a dark-brown chrysalis beneath stones or sticks or other objects on the ground which may give it shelter.

The species is single-brooded in the North and probably double-brooded in the South. It occurs in Canada and the northern half of the eastern part of the United States.

> The mute insect fixed upon the plant
> On whose soft leaves it hangs, and from whose cup
> Draws imperceptibly its nourishment,
> Endeared my wanderings.
>
> WORDSWORTH.

The Silver-spot Fritillary

Argynnis aphrodite (Ar-gyn'nis aph-ro-di'te)

Plate XXI, Fig. 3

See description of the great spangled fritillary and the table above for the characteristics of this species.

Caterpillar.—Length one and one-half inches. This caterpillar closely resembles that of the preceding species, except that there is a velvety black spot at the base of each spine.

Food-plant.—Violets.

When we made our childish observations on the butterflies that had adopted a free silver coinage we often crept up carefully and seized one of them by his closed wings and counted his "dollars" for him. The ones that we caught were undoubtedly the silver-spots, for of all the butterflies that frequent "The Sign of the Thistle" these are most reckless and oblivious of danger when tippling. This species is more common in the northern United States than is the preceding. It flies during July, August, and September. Once about the middle of September I found a specimen caught in the net of the Argiope spider. I rescued it, and while removing the web I was astonished that it could have flown at all on such torn and battered wings. The edges were frayed for a third of the length of the wing, and the sil-

ver was tarnished and the red and black were faded to a dull dust color. But its antennæ were active and its body bright, and it seemed grateful for release and went careening along on its poor wings, brave to the very last. Surely butterflies have their troubles also in a world where the sun does not always shine.

The habits of the caterpillar of the silver-spot are like those of the great spangled. The baby caterpillar rashly comes out of its protecting egg at a time when most creatures are seeking shelter.

The Mountain Silver-spot

Argynnis atlantis (Ar-gyn'nis at-lan'tis)

Plate XXI, Fig. 4

See description of the great spangled fritillary and the table above for the characteristics of this species.

Caterpillar.—Length one and one-half inches. It is very similar to the caterpillars of the silver spot and of the great spangled species, except that it is purplish in hue and the bases of the spines are light colored or pale.

Food-plant.—Violets.

If our childish fancy about butterfly money were true this fritillary would carry on its wings the currency of the Dominion of Canada, for there

is its home and it only visits our mountains and highlands.

While it so closely resembles the two preceding species in habits of caterpillars and in appearance, it may be distinguished from them by the unbroken black band that borders the front half of the front wings next to the fringe. In the other species this black band is broken by orange patches between the wing veins. The "coinage" on the lower surface of the hind wings shows off to a greater advantage, too, against a background of sepia than against cinnamon brown. Mr. Scudder says that the male charms his lady-love by a sandalwood odor which he exhales from his front wings.

The species is single-brooded. It occurs in Canada and the northern half of the eastern part of the United States.

> A butterfly, with golden wings broad parted,
> Nestling a rose, convulsed as though it smarted
> With over pleasure. KEATS.

THE MEADOW FRITILLARY

Brenthis bellona (Bren'this bel-lo'na)

PLATE XXII, FIG. 2, 4

We have in the eastern United States two common species of the smaller fritillaries, which can be distinguished at a

glance from the larger species by their size, as in no case does the length of the fore wing exceed one inch. These butterflies represent the genus Brenthis which differs structurally from Argynnis. The most available character for separating the two is the origin of vein R_2 beyond the apex of the discal cell in Brenthis, and before it in Argynnis.

The smaller fritillaries resemble Argynnis quite closely in the markings of the upper surface of the wings; the under surface not only differs from the pattern of Argynnis, but also shows great diversity among the species. The two common species of our Eastern fauna can be easily separated by the characters given in the table above.

The obscurity of the marginal markings of the lower side of the hind wings in the meadow fritillary (Plate XXII, Fig. 4) is sufficient to distinguish this species.

CATERPILLAR.—Length nearly one inch. Body black, mottled with yellowish or greenish color. The spines arranged in the usual manner of this family are dull brown. It is not unlike the caterpillar of the preceding species except that the pair of spines on top of the first segment are not especially prolonged.

Food-plant.—Violets.

This little fritillary has put no money in its purse; there is not a single silver-spot, angular or round, to be found on the lower side of its wings. Neither is it so handsomely ornamented above as as is the following species, lacking the black scalloped border that makes the wings of the silver-bordered fritillary so ornate. It is to be found

in wet open places where the mint grows, as its favorite tipple is mint nectar.

It has some queer habits. Many of the butterflies of the first brood appearing early in May evidently feel that they have the whole summer before them and are likely to neglect the important transaction of egg-laying for several weeks. The second brood issues in July and the third in September, but owing to the procrastination of the earlier butterflies the broods are hopelessly mixed. Mr. Scudder has found that while the caterpillars of the last brood winter as they are hatched from the egg, many individuals of the second brood when only half grown turn their backs on the flesh-pots of the caterpillar world, fall into a lethargy and wait until spring to finish their growth; from these come the earliest butterflies. Some of these little anchorites, however, seem to forsake their plan and after two or three weeks of fasting turn to and eat their fill and change to butterflies in September. The butterflies are more numerous in September than during the summer months.

The species occurs in Canada, the northern United States, and in Colorado. The butterfly is found "only about wet meadows and bogs, where it frequents the mint blossoms." (Scudder.)

The Silver-bordered Fritillary

Brenthis myrina (Bren'this my-ri'na)

Plate XXII, Fig. 1, 3

This species differs from the meadow fritillary in having on the under side of the hind wings two transverse series of silver spots, one marginal and one submarginal; there are also several larger silver spots on the base of the wing.

Caterpillar.—Length three-fourths inch. In color a mottled green, brown and purple, with spines like the caterpillars of Argynnis except that in this species the pair of spines on top the first thoracic segment are several times as long as the others.

Food-plant.—Violets.

When in our childish ignorance we regarded a small butterfly as not yet fully grown, we often found on thistle blossoms in the pasture certain small butterflies that carried "money" under their wings and we thought them too young to be trusted with so much silver. These small Crœsuses were the silver-bordered fritillaries.

The silver-bordered fritillary is a pretty little creature decorated in rather conventional squares, dots and scallops of black and orange that suggest canvas embroidery. On the lower side of the wings the silver spots are set in with brown and yellow squares and lines; the border of "half coins" on the hind wings is especially prominent

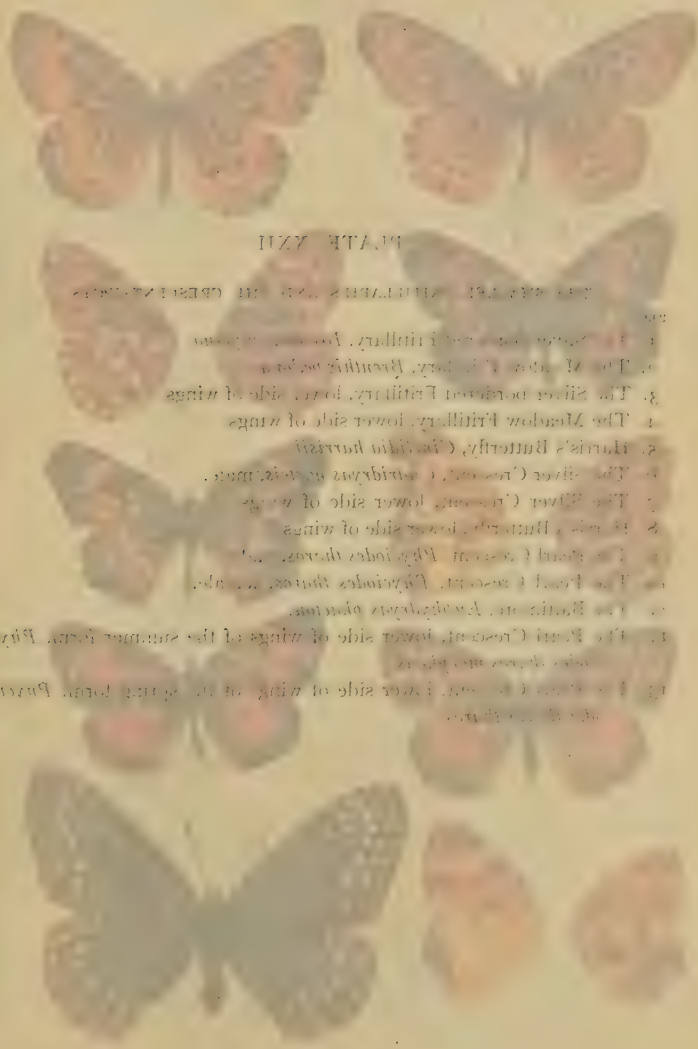


PLATE XXII

THE SMALLER FRITILLARIES AND THE CRESCENT-SPOTS

Fig.

1. The Silver-bordered Fritillary, *Brenthis myrina*.
2. The Meadow Fritillary, *Brenthis bellona*.
3. The Silver-bordered Fritillary, lower side of wings.
4. The Meadow Fritillary, lower side of wings.
5. Harris's Butterfly, *Cinclidia harrisii*.
6. The Silver Crescent, *Charidryas nycteis*, male.
7. The Silver Crescent, lower side of wings.
8. Harris's Butterfly, lower side of wings.
9. The Pearl Crescent, *Phyciodes tharos*, male.
10. The Pearl Crescent, *Phyciodes tharos*, female.
11. The Baltimore, *Euphydryas phaeton*.
12. The Pearl Crescent, lower side of wings of the summer form, *Phyciodes tharos morpheus*.
13. The Pearl Crescent, lower side of wings of the spring form, *Phyciodes tharos tharos*.

Plate XXII.

and ornamental; a border of black points shot with silver margin the fore wings and make one of the most decorative patterns ever found on a butterfly wing, the place where Nature is at her best as a decorator. Despite the small size and slight form of this fritillary it is rather lazy in its flight and is much more given to resting on flowers than to dancing in the air.

The caterpillars that hatch late in the fall pass the winter as they leave the egg. Other caterpillars half grown pass the winter in that stage and produce butterflies early in the next season. The species is presumably three-brooded, but owing to the desultory egg-laying habits of the butterflies the broods are not distinct. It is a butterfly that is decidedly shiftless in family affairs. The chrysalis looks a little like a stout hook, it being bent forward somewhat.

The species occurs throughout Canada and in the northern portions of the United States.

THE CRESCENT-SPOTS

This group includes some of the smaller nymphs; they are distinguished as follows: the club of the antennæ is broad and distinct; and is marked beneath, as in the fritillaries, with a single elevated line or with none. The palpi are slender, compact, the last segment from one-third to one-half

as long as the middle segment. The color of the wings in one of our species is black with an outer marginal row of red spots, but it is usually fulvous, with the front wings broadly margined, especially at the apex, with black.

This is a large group, nearly sixty species occurring in North America. But nearly all of these are restricted to the far West; only five have been found in the Atlantic States, and one of these is rare. Our four common species can be separated by the following table:

A. Apex of the front wings produced, so that the outer margin is about as long as the inner margin; color black with a row of red spots next the outer margin, and two or more rows of yellow spots on outer half of wings. (*E. phaeton*), p. 125. THE BALTIMORE.

AA. The outer margin of the front wings much shorter than the inner margin; color of wings fulvous checked with black or black spotted with fulvous.

B. The outer margin of the wings on the lower side with distinct, narrow, yellow, terminal line of nearly uniform width. (*C. nycteis*), p. 127. THE SILVER CRESCENT.

BB. Terminal line, if present, greatly narrowed at the crossing of each vein.

C. Lower side of hind wings with a broad, transverse central band of white or light buff spots. (*C. harrisii*), p. 126. HARRIS'S BUTTERFLY.

CC. Lower side of hind wings without a broad, transverse, central band of white or light buff spots. (*P. tharos*), p. 129. THE PEARL CRESCENT.

The Baltimore

Euphydryas phaeton (Eu-phyd'ry-as pha'e-ton)

Plate XXII, Fig. 11

The wings above are black, with an outer marginal row of dark reddish-orange spots, and two parallel rows of very pale yellow spots ; on the fore wings a third row is more or less represented. The wings expand two inches or more.

Caterpillar.—Length one inch. In the hibernating stage when they are usually found, the head and first two segments are shining black and the last three black with two orange bands around each. All the other segments have a ground color of orange with various narrow transverse lines of black. There are three rows of black spiny tubercles along each side and one row down the middle of the back. There are also a pair of smaller spines above each proleg. At this stage the caterpillar is three-eighths inch long. Its colors when fully grown are practically the same as described above. It is gregarious in its habits.

Food-plants.—The snakehead and other plants.

This handsome, striking butterfly looks as if it were done in Russian embroidery. The outer border of orange and the regular rows of angular yellowish white spots set against the black background give one the impression of conventional needlework, instead of unconventional nature. Especially is this true of the lower surface of the wings where the pattern is the more elaborate. In its habits the butterfly is very local, remain-

ing near one particular spot all its life. It may be found near swampy places from the middle of June until the middle of July, in Ontario and the northern half of the United States.

The habits of the caterpillars are most eccentric. They live together in a common nest made by weaving together the leaves of their food-plant and portions of the surrounding herbage. After the third molt they cease feeding and remain thus in their tent until the next spring. They do not fall into a lethargy and so endure hunger in a trance. They simply cuddle down and voluntarily fast in the presence of plenty. We kept a brood in a box once during their fast-period. Every time we opened the box inquiring black heads would be lifted in an impatient manner that said quite plainly "Let us alone, please." There they waited from midsummer until the snakehead had put forth leaves next spring. They resumed eating as calmly as if a fast of nine months were no trick at all.

Harris's Butterfly

Cinclidia harrisii (Cin-clid'i-a har-ris'i-i)

Plate XXII, Fig. 5, 8

The upper surface of the wings of this species closely resembles in color and markings that of the butterflies of the genus

Phyciodes. On the under surface the wings are fulvous, with the veins and transverse lines and bars black, and with pale yellow and silvery white spots. On the hind wings the median, transverse, white band is traversed by two black lines near the edges, so as to form three nearly complete bands. Expanse one and three-fourths inches.

CATERPILLAR.—Length nearly one inch; body orange in color ringed with black stripes, with a black line down the back, and ornamented with rows of black spines.

Food-plants.—Asters.

When flying, this butterfly so much resembles the silver crescent that it is likely to be mistaken for it; however, the lower sides of the wings are much darker. The caterpillars have similar habits to those of the silver crescent. It is a New England species, seldom being found south of the 42d degree of latitude.

THE SILVER CRESCENT

Charidryas nycteis (Cha-rid'ry-as nyc-te'is)

PLATE XXII, FIG. 6, 7

The silver crescent is most easily distinguished by the markings of the lower surface of the wings, the outer margin of which has a distinct, narrow, yellow terminal line of nearly uniform width, bordered within and without with brown. Just within this line there is a series of silver-white lunules; these lunules are very small or wanting in cells M_1 and M_2 of each wing. There is a transverse band of silver-white or

light buff spots near the middle of the hind wing on the lower side, and a similar band near the base. Expanse one and three-fourths inches.

CATERPILLAR.—Length nearly an inch; body velvety black, with an orange stripe along the side and with many black spines arranged in lengthwise rows.

Food-plants.—Sunflower, Actinomeris, and other Compositæ.

At first glance the silver crescent seems to be a dark-brown butterfly with a band of orange across both wings; but a closer inspection reveals the band to be made up of various ornamental spots, lines, and patches; and the lower sides of the wings with their many devious and diverse markings of brown and silver reduce to despair one who would write of them a graphic description.

The caterpillars are social at first, but when disturbed coil up and promptly drop to the ground, climbing back again at their leisure when the scare is over. When about half-grown the caterpillars leave the food-plant and hide under sticks and stones or in convenient crevices, and there remain until the next spring, when they finish their growth. There is only one brood in the North; in the South there are two broods, but occasionally some caterpillars of the first brood stop eating in midsummer and hibernate with

their nephews and nieces of the next brood, the offspring of their more ambitious brothers and sisters that completed their growth and produced eggs for the second brood.

The species occurs from Canada to North Carolina and west through the Mississippi Valley. It is single-brooded in the North and probably both single- and double-brooded in the South.

> The gold-barr'd butterflies to and fro
> And over the waterside wander'd and wove,
> As heedless and idle as clouds that rove
> And drift by the peaks of perpetual snow.
>
> JOAQUIN MILLER.

THE PEARL CRESCENT

Phyciodes tharos (Phy-ci-o'des tha'ros)

PLATE XXII, FIG. 9, 10, 12, 13

This species varies greatly in the markings of both upper and lower surface; but it can be distinguished from the allied species found in the East by the characteristics given in the table on page 124. It is not always easy to distinguish the sexes; but usually the yellow of the outer half of the fore wings is more broken by black lines in the female than in the male, and frequently the sinuous row of spots just beyond the middle of the fore wings is of a lighter color in the female. Expanse of wings one and one-half to one and seven-tenths inches.

The species is dimorphic. The two forms are not dis-

tinguishable from above, but differ in the markings of the lower surface of the hind wings.

(1) The Spring Form, *Phyciodes tharos tharos.*—The ground color of the lower side of the hind wings varies from bright yellow to brown sometimes with much white over the basal area, and has strongly contrasting markings. This form was described by Edwards under the name *marcia.*

(2) The Summer Form, *Phyciodes tharos morpheus.*—The ground color of the lower side of the hind wings is a yellow-buff with comparatively inconspicuous markings especially in the male.

This is a widely distributed species ranging from British Columbia and Labrador to Mexico and from the Atlantic to Montana and Colorado. In the extreme North it is single-brooded and only the spring form occurs. In New England it is double-brooded, and the second brood is of the summer form. In the South there are several broods.

CATERPILLAR.—Length, three-fourths of an inch. Body ornamented with rows of yellowish spines; body color black with yellow dots and a yellow band along the side.

Food-plant.—Asters.

The general color effect of this butterfly is red brown with uneven blackish margins; but when examined closely the markings above and below are seen to be most elaborate. It is very numerous, and is found everywhere in the United States except in southern Florida and in the Southwest. It loves open, sunny, weedy places, and is one of the butterflies which loves to drink socially with

its fellows around the mud-puddle. It is a slow flyer, being a sluggish insect in all its stages.

The caterpillars are social when they first hatch from the egg and live on the parenchyma on the lower side of the leaf; later they eat holes into the leaf. When disturbed they coil up and drop. There are two broods, and the caterpillars of the second brood when about half-grown hide in safe corners and there pass the winter.

THE ANGLE-WINGS

With the exception of a single species, the buckeye, all of the angle-wings found in our Eastern fauna are sharply distinguished from other nymphs by having hairy eyes. The club of the antennæ is long and fairly distinct; it is marked with three slightly elevated lines. The wings are usually decidedly angular and excised; but in the last four species described below this character is not so prominent as in the others. A large proportion of the species hibernate in the adult state, and some of them are the first butterflies to appear in the spring. Some of the hibernating species, however, remain in concealment till quite late in the season.

The species that occur in the eastern United States can be separated by the following table:

A. Without a silvery spot on the center of the lower surface of the hind wings.

B. Eyes naked; upper surface of fore wings with one or two conspicuous eyelike spots. (*J. cœnia*), p. 160.

THE BUCKEYE.

BB. Eyes hairy; upper surface of fore wings without conspicuous eyelike spots.

C. Fringe of wings alternately white and dark; apical portion of front wings with a group of white spots (*Vanessa*).

D. The orange colors on upper surface of fore wings confined to a single transverse belt. (*V. atalanta*), p. 154. THE RED ADMIRAL.

DD. The orange colors on upper surface of fore wings not confined to a single belt.

E. Two large eyelike spots on the lower surface of the hind wings, each broader than a cell. (*V. huntera*), p. 156. THE PAINTED BEAUTY.

EE. At least four eyelike spots on the lower surface of the hind wings, never broader than a cell. (*V. cardui*), p. 158. THE COSMOPOLITE.

CC. Fringe of wings not composed of alternating black and white sections; no white spots on apex of fore wings.

D. Outer margin of wings black with an orange fulvous submarginal band. (*A. milberti*), p. 151. THE AMERICAN TORTOISE-SHELL.

DD. Outer margin of wings yellow, with a submarginal row of blue spots. (*E. antiopa*), p. 148. THE MOURNING CLOAK.

AA. With a golden or silvery spot on the lower surface of hind wings.

B. Inner margin of fore wings nearly straight. (*E. j-album*), p. 146. THE COMPTON TORTOISE.

BB. Inner margin of fore wings roundly excised beyond the middle (*Polygonia*).

C. Lower surface of hind wings with two silvery marks, a dot and a lunule forming an interrogation-mark. (*P. interrogationis*), p. 134. THE VIOLET-TIP.

CC. Lower surface of hind wings with a single, central, silvery comma or bent bar.

D. The silvery comma expanded at the ends.

E. The outer third of the lower surface of the wings variegated with green. (*P. faunus*), p. 138. THE GREEN COMMA.

EE. The outer third of the lower surface of the wings variegated with wood-brown. (*P. comma*), p. 140. THE HOP-MERCHANT.

DD. The silvery comma tapering at the ends. (*P. progne*), p. 143. THE GRAY COMMA.

GENUS POLYGONIA

The four immediately following species belong to the genus *Polygonia*. Of all the angle-wings these most deserve the name. They look as if Mother Nature had with her scissors snipped the edges of their wings, fashioning notches and points according to the vagaries of an idle mood; and polygons they surely are. The upper sides of the wings have a ground color of coppery red, marked with velvety borders and spots, the design being similar in all the species. The

under sides of the wings are marked and marbled with beautiful and intricate patterns in browns that vary from reddish to seal, and in grays of all shades; and each hind wing bears wrought in shining silver an "initial" which characterizes the species. In flight all these butterflies follow a zigzag course, so swiftly that the eye can scarcely follow them. They frequent woodsy paths and roads and are likely to alight on the trunk of a tree or on the ground and close their wings, the variegated browns of the under surface rendering them almost invisible. The caterpillars are spiny, and the head is sometimes adorned with a pair of thorny spines. The chrysalids are angular, usually the color of dead leaves, and are made inconspicuous by both colors and pattern.

The Violet-tip

Polygonia interrogationis (Pol-y-go'ni-a in-ter-ro-ga-ti-o'nis)

Plate XXIII, Fig. 1, 2, 4, 6

This species differs from its allies found in the East by the presence of a black spot on the upper surface near the base of cell M_2 of the front wings, a short distance from the black bar on the discal vein, and opposite the spot in cell M_3; and in the form of the silvery mark on the lower surface of the hind wings, which consists of a dot and crescent, resembling

PLATE XXIII

THE ANGLE-WINGS

Fig.

1. The Violet Tip: the typical form, Polygonia interrogationis interrogationis, female.
2. The Violet Tip: the dark form, Polygonia interrogationis umbrosa, female.
3. The Green Comma, Polygonia faunus.
4. The Violet Tip: lower side of wings of the dark form, male.
5. The Green Comma, lower side of wing.
6. The Violet Tip: lower side of wings of the typical form, male.
7. The Gray Comma: lower side of wings.
8. The Gray Comma, the typical form, Polygonia progne progne.

PLATE XXIII

THE ANGLE-WINGS

Fig.

1. The Violet Tip; the typical form, *Polygonia interrogationis interrogationis*, female.
2. The Violet Tip; the dark form, *Polygonia interrogationis umbrosa*, female.
3. The Green Comma, *Polygonia faunus*.
4. The Violet Tip; lower side of wings of the dark form, male.
5. The Green Comma, lower side of wings.
6. The Violet Tip; lower side of wings of the typical form, male.
7. The Gray Comma; lower side of wings.
8. The Gray Comma, the typical form, *Polygonia progne progne*.

Plate XXIII.

somewhat an interrogation-mark, but more nearly a semicolon. On the upper side the outer margins of the wings and the tails of the hind wings are tinged with violet. Expanse two and one-half to three inches.

This species is dimorphic; and the two forms differ so constantly and in such a marked manner that they were described as distinct species. In *P. interrogationis interrogationis* the upper surface of the hind wings is not much darker than that of the fore wings, and there is a submarginal row of fulvous spots in the broad ferruginous brown border; this variety is commonly known as *fabricii*. In *P. interrogationis umbrosa* (P. i. um-bro'sa) the outer two-thirds of the upper surface of the hind wings is blackish, and the submarginal fulvous spots are obliterated, except sometimes faint traces near the costal margin. Many other differences are pointed out by Scudder. The relation of these two forms to each other was thoroughly investigated by Edwards. The dimorphism is seasonal, but not strictly so. All of the wintering butterflies are *fabricii;* and from their eggs are produced chiefly *umbrosa;* but *fabricii* occurs in the summer broods.

CATERPILLAR.—About one and one-half inches long. Reddish-brown in color with lighter markings of irregular dots and patches. It has many branching spines, a pair of them being on the top of the head.

Food-plants.—Elm, hop, hackberry, nettle, false nettle, and linden.

It would seem at first glance that certain butterflies come to us labeled with a recognition mark on the hind wings, so that we shall have no trouble about identifying the species. The violet-

tip thus wears a semicolon, wrought in silver and very striking. But Fabricius evidently never stopped to "count two" when he saw this, as he should have done had he been versed in the proper way of regarding pauses, but at once named the species *interrogationis*, to the utter confusion of beginners in butterfly study, who try in vain to make an interrogation-mark out of this very plain semicolon. The popular name of this butterfly is much more apropos, for it is not only violet-tipped but violet-edged. The border on its wings of rich velvety maroon shading off at the edge into lavender fills the lover of color with a sense of luxurious content. The exquisite shadings of brown on the under side of the wings have a purplish tint that is almost an iridescence.

The violet-tip is the largest of the polygon butterflies and is the most graceful in shape of all the butterfly family. As it passes the winter in the winged stage it finds its first food in spring in the sap of trees, and it undoubtedly rejoices in the industry of sugar-making, which induces man to kindly tap trees for its especial benefit. It frequents open places within or near woodlands. In the fall it is more neighborly, and may often be found about our orchards taking its share of the ripe fruit.

The caterpillar is well disposed toward its fellows, though not gregarious; if you find one feeding on a leaf you are likely to find others in the neighborhood. It has a comical way of resting after eating its fill; it lifts its head and disdainfully turns it away, as if to say, "Please excuse me from any more of that." The chrysalis is suspended near the feeding-place and looks like a bit of dried and broken leaf. It is said that Fabricius thought this chrysalis looked like an interrogation-mark and so gave the name; this seems rather far-fetched considering the punctuation plainly to be seen on the wings.

The butterfly is interesting in that it has two forms, a summer form which has the upper sides of the hind wings nearly black except at base, and the markings almost obscured thereby. This form is called *umbrosa*. The winter form is called *fabricii*. They were regarded as two distinct species until they were bred.

This species is found in Canada and throughout the United States east of the Rocky Mountains. There are two broods in the North and three or four in the South. The butterflies hibernate.

Zigzag butterflies many a pair
Doubled and danced in sunny air.

ELIZABETH AKERS.

The Green Comma

Polygonia faunus (Pol-y-go'ni-a fau'nus)

Plate XXIII, Fig. 3, 5

The silvery mark of the hind wings is usually in the form of a C or a G, the ends being more or less expanded (Plate VI, Fig. 2), but sometimes it is reduced to the form of an L. The lower surface of the wings is more greatly variegated than in any other species of this genus; and there is a larger amount of green on this surface than in any other of the Eastern species, there being two nearly complete rows of green spots on the outer third of each wing. Expanse two inches or more.

Caterpillar.—Length, one and one-fifth inches. Head black and bearing a pair of spines. Body reddish, or yellowish brown with a large patch of white on the back behind the middle. The rows of branching spines are light colored. It makes no nest and hides beneath the leaf.

Food-plants.—Black birch, willow, alder, currant, and gooseberry.

The strong resemblance existing between the different commas makes the recognition of the species on the wing quite difficult. However, if the sun glints across the wings of the green comma, it reveals on the upper side markings of a rich velvety obscure olive green; while below a paler and brighter olive is wrought into the ornate pattern. While all this is easily seen when we hold a pinned specimen in the hand it is by no

means so easily observed when the butterfly is flitting about in the open. In western New York, on a hill from whose crest a glimpse of Canada is possible on a clear day, we once saw a comma darting about a mass of ferns at the side of a road threading a dense beech woods. We were very sure that we detected on this butterfly the olive-green color of the green comma. Breathlessly we waited for the nervous creature to alight, which it did on some not very attractive refuse in the road. Yes, it was surely green! A professorial hat was brought into use as an instrument for capture. Stealthily the approach was made, but at the last moment the butterfly, eluding the headgear, made a wild flight far above the professorial head and we saw it no more. There is something strange about the madness which possesses one hunting for species. What difference did it make to us what that butterfly was or was not? None at all! And yet the butterfly hunter will understand that ever afterward when we passed that spot we always grew pensive and murmured, "Was it really a green comma?"

The caterpillar of this species is caparisoned in a white saddle-cloth and looks quite different from other caterpillars of the genus. The green comma is a Northern species, not occurring south

of Massachusetts in the East; in the middle West it is found as far south as Iowa. It is single-brooded, although the butterflies may be found all summer; it hibernates as a butterfly.

The Hop-merchant

Polygonia comma (Pol-y-go'ni-a com'ma)

Plate XXIV, Fig. 1, 2, 4, 6

As in the preceding species, the silvery mark of the hind wings is in the form of a C or a G; but the general color of the lower surface of the hind wings is very different, being marbled with light and dark brown; and the green spots so characteristic of *faunus* are represented here by a few liliaceous scales on a submarginal row of black spots. Expanse two inches or more.

Two forms of this species occur. In one, *P. comma dryas*, the hind wings above are suffused with black on the outer half, so that the submarginal row of fulvous spots is obscured, and on the lower side the wings are more yellowish than in the other form. The latter is the typical form, *P. comma comma*. This form has been known under the name *harrisii*.

This species resembles the violet-tip in appearance and in its dimorphism; but it is a smaller butterfly, and it lacks the spot in cell M_2 of the fore wings. It also differs in the form of the silver mark on the lower side of the hind wings.

Caterpillar.—Length one inch; color varying from dark brown to greenish or nearly white; it is marked with blotches and transverse lines and is most variable as to color and mark-

Plate XXIV

The Hop-merchant

Polygonia comma (Pol-y-go'ni-a com'ma)

Plate XXIV, Fig. 1, 2, 4, 6

PLATE XXIV

THE ANGLE-WINGS

Fig.

1. The Hop-merchant; the typical form, *Polygonia comma comma*, female.
2. The Hop-merchant; the dark form, *Polygonia comma dryas*, female.
3. The Buckeye, *Junonia cœnia*.
4. The Hop-merchant; lower side of wings of the dark form, male.
5. The American Tortoise-shell, *Aglais milberti*.
6. The Hop-merchant; lower side of wings of the typical form, female.

Plate XXIV.

ings. It is armed with thorny spines, and has one pair on its head.

Food-plants.—Nettle, hop, elm, etc.

At first glance we might take this butterfly to be a dwarf violet-tip. The shape of the wings is similar to that of the violet-tip, and with sufficient imagination one can see the violet margins on them. But the punctuation on the under side of the hind wing is quite different. In this species it is not an inverted semicolon, but looks more like an erratic G, the lower portion of it wandering off at an angle. If we hold the butterfly head toward us we can perhaps make of this mark a more or less distorted comma.

The hop-merchant hibernates as a butterfly, and is one of those which we find dashing about the woods during the first warm days in March. Its flight is a miracle of erratic swiftness. It has much curiosity and a disposition to meddle, evincing the same by dashing at anything it happens to see moving; and it is always more than willing to join in any fray. It starts up like magic from the path in front of us, the gleam of its red wings making it seem like a bit of chain-lightning as it zigzags upward over our heads, when we lose sight of it altogether; but after we pass, if we take note, we will see that it has alighted again

on the selfsame spot where we first found it. It is not visible unless its wings are open. The mottled browns on the under side of the wings and their angular outline afford one of the prettiest studies in protective coloring which we know. The hop-merchant likes paths through the woods and damp places.

A pretty superstition about the chrysalis gives the species its common name. Along the back of the angular chrysalid are rows of tubercles with bases which shine like metal. If they shine golden then the price of hops will be high; but if they shine like silver then the price will be low.

The caterpillar sometimes harvests the hops for the farmer; but usually it does not occur in sufficient numbers to do damage. For the way the eggs are laid in columns and the action of the young caterpillar when descending, see Mr. Scudder's account in that most delightful of books, Everyday Butterflies. The caterpillar about the time of its third molt cuts the central veins of the leaf near the midrib most cunningly, and thus is able to draw the edges of the leaf together, making for itself a safe house for protection while eating. The chrysalis is like a bit of dead and broken scrolled leaf, and is as perfectly pro-

tected by shape and color as is the butterfly. The species is double-brooded in the North, and at least three-brooded in the South. It is a North-eastern species, extending south to North Carolina and Tennessee.

> Fluttering like some vain painted butterfly
> From glade to glade along the forest path.
>
> ARNOLD.

THE GRAY COMMA

Polygonia progne (Pol-y-go'ni-a prog'ne)

PLATE XXIII, FIG. 7, 8

In its general appearance this butterfly closely resembles *P. comma*, but it can be readily distinguished by the form of the silvery mark, which is L-shaped and tapers toward the ends.

Two forms of this species occur, the lighter form, *P. progne progne*, in which the ground tint of the upper surface of all of the wings is concolorous; and the tail at the end of vein M_3 of the hind wings tapers gently with the tip broadly rounded. And the darker form, *P. progne l-argentum*, which has the hind wings obscured above with dusky tints; the submarginal series of fulvous spots nearly obliterated; the L-shaped mark of the lower side slenderer, with the longitudinal limb much shorter than the other, by which it approaches more the exact form of an L, or is wholly obliterated; and with the tail at the end of vein M_3 of the hind wings almost triangular. The difference in color between these two forms is not as marked as in the case of the two forms of the violet-tip.

CATERPILLAR.—About one inch long when mature. The body is yellowish brown marked with greenish black. Its spines are branched and mostly black. A pair of long slender spines are on the top of the head. Feeds openly, and lifts the tail and twists the head at right angles when resting. Looks like a yellow leaf.

Food-plants.—Currant, gooseberry, and elm.

This is another frequenter of woodsy paths and roads, and would be difficult to distinguish from the green comma were it not for the wide angled L embroidered on the lower wing. The upper surface of the hind wing is shaded from coffee-color at center out to a darker edge, and in this the coffee-colored spots near the margin are not half circles as in the green comma, but are mere points of color. The lower side of the wings is made up of many wavy lines of ashen hue. These fine lines on the beautifully shaded background look like woof and warp in more or less diagonal pattern extending across the inner dark half of the wing as well as through the light band and the dark edges where they follow the jagged margin in a weft of beautiful points and scallops. There is nothing from nature's looms that so fills one with the sense of inadequacy of words for description as the under surface of the gray comma's wing. The butterfly

knows the use of the wings too, for they are to it the invisible cloak of the fairy tale. We saw one the other day basking in the middle of a somewhat muddy wood-road. The shining red copper of its upper wings made it a most striking object. As we approached, it suddenly disappeared and we were unable to point it out to our companions. But when we took another step and came too close it dashed up above our heads and was lost to our sight before we could exclaim ; at the first disturbance it had simply closed its wings and thus disappeared. It is frequently found in orchards where the fallen and decaying fruit gives it a tipple.

The gray comma abjures the world while the October sun is still warm and hides itself and goes to sleep to be awakened by the first balmy breezes of spring.

The caterpillar, while giving preference to the wild currant and gooseberry, sometimes takes advantage of the cultivated species.

This species occurs in Canada and in the northern portion of the United States, except in the extreme West.

The Compton Tortoise

Eugonia j-album (Eu-go'ni-a j-al'bum)

Fig. 34

This butterfly resembles in its general appearance those of the genus *Polygonia*, but it is sharply distinguished from them by the inner margin of the fore wings being nearly straight, by the heavier markings of the fore wings, and by the presence of a whitish spot on both fore and hind wings, near the apex between two larger black patches. On the lower surface of the hind wings there is a small L-shaped silvery bar.

Caterpillar.—Length one and one-half to two inches. It is greenish in color, more or less speckled and striped with lighter hues. Its head and its body bear black, bristly spines like the caterpillars of the preceding genus. The caterpillars feed in flocks and are rarely found.

Food-plants.—White birch and willow.

This butterfly, though larger than the Polygonias, strikingly resembles them in the cut of the wings, except that the inner margins of the front wings are straight. Not because it is so slow is it called tortoise, but because of the shades of brown and red and ochre yellow beautifully blended on the upper surface of its wings which resemble the tints of the tortoise-shell. The white spot on each wing is so placed as to heighten by contrast the rich velvety hues. While its coloring above is quite different from that of the Polygonias, it is very like them in the intricate pat-

tern of shaded brown that covers the under side of the wings. On the hind wing also may appear a small wide-angled L. Looked at one way on one wing this does resemble a J somewhat, and as it is wrought in white there is some faint reason for calling the species *j-album*. However, this white initial is sometimes omitted altogether.

FIG. 34.—The Compton tortoise.

The Compton tortoise, like the Polygonias, haunts glades and wood roads. It is a swift flyer and hard to capture, as it has the Polygonia trick of folding its wings and disappearing against the bark of a tree or the leafy floor. The butterfly issues from a greenish gold-trimmed chrysalis about the first of July; it flies all summer, and undaunted by the exigencies of butterfly life it seeks a hibernating place in late October or November.

It awakens from its winter sleep while the spring still lingers in the lap of winter and is on the wing at least a month before the earliest leaves of birch and willow give it place whereon to lay its eggs. If it is single-brooded, as is supposed, the Compton tortoise is a Methuselah among butterflies as it is nearly a year on the wing.

This species occurs throughout Canada and the northern portion of the United States east of the Rocky Mountains.

The Mourning-cloak

Euvanessa antiopa (Eu-va-nes'sa an-ti'o-pa)

Plate XXV, Fig. 1, 2, 3; Plate II, Fig. 1, 2; and Fig. 35

The wings above are purplish brown, with a broad yellow border on the outer margin sprinkled with brown, and a submarginal row of blue spots (Fig. 35); there are also two yellow patches on the outer half of the costal margin of the front wings. Expanse of wings two and one-half to three and one-half inches.

Caterpillar. — Length two inches. Velvety black in body-color, covered with small, white, raised dots, which produces a pepper-and-salt effect. The spines are long and sparsely branched. There is a row of red spots along the middle of the back. The head has no spines. The prolegs are reddish.

Food-plants.—Elm, willow, poplar, and others.

In the vanguard of the spring appears this butterfly. Before the hepatica shakes its blos-

PLATE XXV

THE MOURNING-CLOAK

Fig.

1. Eggs greatly enlarged.
2. Full-grown larva.
3. Butterfly just out of the chrysalis skin.

(From photographs by Professor M. V. Slingerland; colored by Mrs. Slingerland.)

PLATE XXV

THE MOURNING-CLOAK

Fig.

1. Eggs greatly enlarged.
2. Full-grown larvæ.
3. Butterfly just out of the chrysalis skin.

(From photographs by Professor M. V. Slingerland, colored by Mrs. Slingerland.)

Plate XXV.

soms out of their blankets, or the pussy-willow lifts its fur, the mourning-cloak bravely leaves its winter quarters; it flutters out into the sunshine that filters down through the leafless trees, and seeks a little refreshment wherever the sap-tides push through bruised bark; or it rests on some bare mossy mound with a southern exposure and

FIG. 35.—The mourning-cloak.

spreads out its yellow-banded purple wings in an effort to get what warmth it may from the March sun. How the winter-tired eyes are gladdened by this courageous flutterer must be known by experience rather than by description. We are glad that our European neighbors also have the mourning-cloak as a sign of returning spring. The wider its cheer is extended the better for all.

Our English Cousins call it "The Camberwell Beauty."

The eggs are laid in clusters and are often placed in a compact mass around a twig. Very beautiful eggs are they; but Madam Antiopa is a careless mathematician. Sometimes her egg is eight- and sometimes seven-sided, the areas marked with ridges in a highly decorative manner, as may be seen in Plate XXV. As soon as the caterpillars emerge from the egg they arrange themselves side by side, close together, heads just reaching the edge of the leaf on which they feed, making an orderly eating class in the green school-room. They are sociable little fellows for all their bristly spines, and live together all their lives and often hang up near each other when they change to chrysalids. Once when a brood was reared in our insectary it was discovered that when a noise was made on a tin pan or anyone with a bass voice sang, these caterpillars would rise as one, lifting the front half of the body from the leaf, and would shake or tremble as if they had the palsy. They were not disturbed by a very loud noise, but within a certain range they would immediately respond, and when all were thus trembling and shaking they presented an absurd spectacle.

The species is two-brooded in most localities, the second brood of caterpillars appearing in August. It is distributed from the Atlantic to the Pacific, and from the arctic circle to the Gulf of Mexico.

From time to time have seen the large *Vanessa antiopa* resting on the black willows, like a leaf still adhering.

THOREAU.

THE AMERICAN TORTOISE-SHELL

Aglais milberti (Ag'la-is mil-ber'ti)

PLATE XXIV, FIG. 5

The wings above are brownish black with a broad orange fulvous band between the middle and the outer margin. There are two fulvous spots in cell R + M of the front wings, and a submarginal row of bluish lunules on the hind wings. Expanse of wings two inches.

CATERPILLAR.—Length about one inch; body above black, covered with whitish papillæ. At the sides and underneath, greenish yellow. It is beset with bristly spines, and the black head has two white papillæ on top. The larvæ are gregarious in habits.

Food-plant.—Nettle.

This butterfly does not resemble tortoise-shell in its colors as much as does the Compton tortoise. It is very easily recognized while flying by the broad orange-brown band shading into yellow on its inner edge that crosses both wings between

the middle and outer dark margin. The edges of its wings just suggest the angles which give the name to the group. Its dark-brown antennæ are prettily tipped with orange brown.

It is common throughout its range and may be found in open hilly fields that border on woodlands; it also frequents roadsides where the ruddy gleam of its wings makes it conspicuous. However, the under side of the wings, dark brown with the band of wood color, renders it invisible when its wings are closed. It hibernates sometimes as a chrysalis and sometimes as a butterfly.

A favorite fairy tale of our childhood was that of the eleven wild swans where the captive maiden had to weave an armor of nettles which she beat with her own delicate hands for her eleven brothers to free them from the magic of a wicked witch. Once when that tale was fresh in our fancy we discovered eleven little caterpillars ranged closely side by side eating the edge of a nettle leaf. As we touched the leaf, they all raised their heads and wagged them back and forth in concert and we stole away in awe, never doubting that the poor princes were again in the toils of the witch. If we had watched the later doings of these caterpillars and had seen the way they cut the nettle

leaves and wove them together for a house we would have been doubly convinced of the enchantment; for the life of this caterpillar from the pale-green, barrel-shaped, ten-ribbed egg to the pale-brown or golden-green chrysalis is like a fairy tale.

The species occurs in the northern portions of the United States and in Canada.

THE THISTLE BUTTERFLIES

"*At the Sign of the Thistle*" is the favorite lounging-place of many butterflies. But the three following species are such inveterate frequenters of this hospice of the open fields that they have won for themselves the name of the Thistle Butterflies. As if in token of their allegiance to the soft purple-pink blossoms they all wear on the under side of their fore wings, this color intensified so that we call it rose color when we should call it thistle-blossom color. Above they are orange and black with white spots, and the antennæ are tipped with orange. The caterpillars are less spiny than those of the preceding genera and live singly in nests made of silk and the leaves of the food-plant. The chrysalids often have golden tubercles. These three butterflies have a wide

range, following the cosmopolitan thistle wherever it flaunts its sign.

The Red Admiral

Vanessa atalanta (Va-nes'sa at-a-lan'ta)

Plate XXVI, Fig. 1, 2

The wings are purplish black above. On the fore wing there is a bright orange-colored band beginning near the middle of the costa, and extending nearly to the anal angle; between this and the apex of the wing are several white spots; on the hind wing there is an orange band on the outer margin enclosing a row of black spots. The lower surface of the wings is shown on the plate. Expanse of wings two and one-fourth to three inches.

Caterpillar.—Length one and one-fourth inches; it varies much in color, being usually dull yellow mottled with black, and with a yellow stripe along the side. The head has no spines, but the body has both branching spines and hairs.

Food-plants.—Nettle, hop.

This most striking butterfly has a cultivated taste and is a frequenter of sunny gardens on both continents. Its blue-black wings, the front ones spotted with white and with a "bias" band of orange red and the hind ones margined with red, make it so conspicuous that even those who are acquainted with only three or four butterflies know the red admiral. However, the lower side of the wings is the more beautiful, the "bias"

band being of exquisite deep rose color shading off at each end to pale pink, and between it and the large white spot is an irregular oval outlined in blue purple. The hind wings have an elaborate peacock-feather border wrought in browns varying from dark to pale wood color. In fact the under side of the red admiral's wings is wonderful both in color and pattern. It is unfortunate that after death the rose color disappears, leaving only the copper red of the upper side, so that this insect shows its real color only when it is alive.

When we wonder what nettles were made for we had best ask the question of the red admiral caterpillar. If we ask it with diligence, we will get the answer from a baby caterpillar in a new leaf at the top of the plant which it has lined and drawn together for protection and food ; or from a larger caterpillar under a leaf lower down which has been gnawed at the midrib near its base and made to droop and thus fashioned into a tent. Each time it molts, this caterpillar turns civil engineer and architect and constructs a new abode of a leaf. These tents are covered above but open below, and may be easily found because of the wilting leaf. The chrysalis is often hung in the last tent and is an exquisite

little object, brown and ashen with golden spots.

There are two broods; both butterflies and chrysalids hibernate, but the wintering butterflies remain long in their winter quarters, being seldom seen before the second week in May. This butterfly occurs over nearly the whole of the European and North American continents.

The Painted Beauty

Vanessa huntera (Va-nes'sa hun'te-ra)

Plate XXVI, Fig. 3, 4

The wings above are very dark brownish black, with large irregular spots of golden orange. In the apical portion of the fore wings there are several white spots. The lower surface of the wings is represented on the Plate. A characteristic feature is the presence of *two* submarginal eyelike spots on the hind wing. Expanse of wings two inches to two and one-half inches.

Caterpillar.—Length one and one-fourth inches. The color of the body velvety black with narrow cross lines of yellow; and there is a silvery white spot on each side of each of the posterior segments, making a row of white spots on each side of the rear two-thirds of the caterpillar. The head has no spines, but the body has rows of bristly spines.

Food-plants.—Everlasting (Graphalium), and allied plants.

This butterfly may be seen along roadsides from May until November, from morning until

nearly sunset, hanging in apparent bliss to the red purple blossoms of the thistle, fitfully lifting itself to thrust its tongue down in another place, opening wide its orange-yellow and black wings, then shutting them to show the delicate rose color of the under side of the front wings and the two eye-spots of the hind wings. In watching it on its favorite flower one wonders if that rose color on the under side of the front wings is not protective, it harmonizes so well with the pink of the blossom.

Much might be expected of a butterfly which receives its early nourishment from the immortelle. Most interesting is the habit of the caterpillar when just from the egg. Mr. Scudder tells us it constructs a mat of the silken hair of the leaf of the everlasting woven together with its silk, and beneath this it hides and feeds. Later it fastens two of the leaves together and feeds therein, and later in the season delights in eating the blossoms, which it encloses in a web. It hibernates as a chrysalis sometimes, but oftener as a butterfly, not leaving its winter quarters before the middle of May.

The species occurs in Ontario and nearly the whole of the United States.

The Cosmopolite

Vanessa cardui (Va-nes'sa car'du-i)

Plate XXVI, Fig. 5, 6

This butterfly resembles the preceding very closely in color and markings. There is, however, a smaller proportion of orange markings; and on the lower surface of the hind wings there is a submarginal row of four or five eyelike spots. Expanse of wings two and one-half to three inches.

Caterpillar.—Length one and one-fourth inches. The head is dark colored and has hairs on the top instead of spines. The body is dull greenish yellow mottled with black, and has a brighter yellow stripe along the side. The spines are bristly and yellowish in color.

Food-plants.—Thistle, mallow, everlasting.

Nothing makes us feel more neighborly to Europe, Asia, Japan and Australia than to realize that the butterfly we saw this morning hovering over the thistle blossoms in the pasture is haunting the thistle blossoms of these diverse countries. The cosmopolite is the most widely distributed of any of our butterfly species; only South America and the Arctic regions are unfavored by the presence of this beautiful creature. It is a strong flyer and has been discovered hundreds of miles out at sea; and there are records that it migrates in flocks from clime to clime. On its rose-lined wings it rises to the cold heights of

the Rockies, the White Mountains, the Alps, and the mountains of Asia. On these same exquisite wings it hovers over the open fields of India, Italy, Spain, Mexico and New Zealand, and over the tropical foliage of the Pacific Islands.

The colors and markings of the cosmopolite on the upper side of the wings are so like those of the preceding species that even the eyes of experts might not distinguish the two. The under side of the front wings bears the same rose-colored band, but each hind wing of the cosmopolite bears near the margin four small eye-spots instead of two large ones as with the painted beauty. In fact the under side of the hind wings of the cosmopolite, with its eye-spots set in complicated patterns of white and brown and purple tints, looks like a web from Persian looms.

One would think that the caterpillar would feel quite protected by the sharp "prickers" that cover its food plant, but from the beginning it protects itself with a nest. At first it lives beneath a leaf covered by a web. Then it takes possession of the upper side, drawing the leaf together for protection. Then it makes a nest of several leaves held together by a web which has woven into it

in exposed places bits of the leaves and the thistle spines bitten off for the purpose. The pretty pearly, greenish or bluish chrysalid seamed with black and banded with pale brown and set with gilt tubercles may be found in the last nest of the caterpillar. In the northern United States the butterfly is double-brooded and winters in the adult stage. In Southern countries the cosmopolite is on the wing all winter.

Over the fields where the brown quails whistle,
Over the ferns where the rabbits lie,
Floats the tremulous down of a thistle.
Is it the soul of a butterfly?

HIGGINSON.

THE BUCKEYE

Junonia cœnia (Ju-no'ni-a cœ'ni-a)

PLATE XXIV, FIG. 3

The wings above are blackish brown; on each there are two eye-spots, a large one and a small one; the small one of the fore wings is sometimes obscure. On the fore wings there are two transverse fulvous bars in cell R + M, and an oblique whitish band beyond these, which arises on the costal margin and extends to the larger eye-spot. Expanse of wings two inches to two and one-half inches.

CATERPILLAR.—Length one and one-fourth inches. It is dark gray in color with yellow lengthwise stripes and is spotted

with yellow or orange. It bears short, branching spines, one pair being on the top of the head. It feeds without cover.

Food-plants.—Gerardin, especially the figworts, snapdragon, and plantain.

From the Gulf States there comes northward varying distances each season a butterfly bearing on the upper side of its wings six large eye-spots. Of these the front wings bear two and the hind wings four. Its ground color of olive green banded and margined with copper and decorated with eye-spots makes this butterfly very striking in appearance. On the lower side the eye-spots are represented by indistinct dots on the hind wings or very small ocelli. Strangely enough, in the latter case the larger spot on the upper side is transformed into two small ones on the under side. But look at this butterfly, holding it under side toward you, and you will see the use of the eyes on the front wings. These, set in an irregular band of flesh color, make the creature look like an owl's head with great staring eyes. It would require great temerity on the part of a bird to go near a flower that carried on its farther side such eyes as these.

The buckeye loves open fields, and is especially saucy and impudent to other butterflies. It is many-brooded in the South, but prob-

ably has a single brood late in the season in the North.

> And I admired and took my part
> With crowds of happy things the while:
> With open velvet butterflies
> That swung and spread their peacock eyes,
> As if they cared no more to rise
> From off their beds of camomile.
>
> JEAN INGELOW.

THE SOVEREIGNS

The sovereigns differ from other nymphs in having the club of the antennæ marked with four slightly elevated lines, and in that the first three veins of the hind wings separate at the same point (Fig. 30). In the other nymphs the humeral vein arises beyond this point. The club of the antennæ is very long, and increases in size so gradually that it is difficult to determine where it begins. In its thickest part it is hardly more than twice as broad as the stalk. The palpi are slender, and the wings are rounded.

The larvæ present a very grotesque appearance, being very irregular in form, and strongly mottled or spotted with color.

Only a single genus is represented in the eastern United States. The species can be separated as follows:

A. Ground color of wings black.

B. Wings with a transverse white bow.

C. White bow of wings broad and extending across both wings. (*B. arthemis*), p. 167.
THE BANDED PURPLE.

CC. White bow of wings narrow and more or less imperfect. (*B. proserpina*), p. 170.
THE HYBRID PURPLE.

BB. Wings without any white bow. (*B. astyanax*), p. 166.
THE RED-SPOTTED PURPLE.

AA. Ground color of wings orange or red brown.

B. Ground color of wings orange. (*B. archippus*), p. 170.
THE VICEROY.

BB. Ground color of wings red brown. (*B. floridensis*), p. 173. THE VICE-REINE.

The especially interesting feature of this group is found in the caterpillar habits.

The egg is laid on the tip of the leaf of the food-plant and as soon as the little caterpillar hatches it begins feeding across the end of the leaf, leaving the midrib. It feeds only by night, and during the day rests stretched out on this bare midrib, which it upholsters in silk and stiffens with bits of the leaf woven in, as Mr. Scudder thinks, to keep the denuded midrib from curling. After a little it makes a bundle out of bits of the leaf and fastens this on the midrib next to the uneaten portion; as it eats the leaf it moves this bundle down. This seems to be a method

of diverting the attention of any of its foes, which should they start out exploring the midrib and encounter this worthless bundle would straightway turn back in disgust. After the second molt it rests by day on a twig or a leaf-petiole.

At first the caterpillar is cylindrical in shape though somewhat warty, but as it molts it changes form and becomes most grotesque in appearance. It is humpy and spiny, and the enlarged second thoracic segment bears two tall branched spines like the pompons of a drum-major. It has several absurd habits; sometimes it rests with its head bent and the pompons touching the leaf and its tail in the air as if it were trying to stand on its head; or it moves fitfully and sometimes trembles and shakes as if it were experiencing a chill. Mr. Scudder says that it leans its head on the leaf or by the side of the stem on which it is resting as if "weary of this world"; and when attacked, swings the head in a "ferocious fashion."

The chrysalis is peculiar in shape. The back of the second abdominal segment bears a large excrescence that has been compared to a "Roman nose."

Most of the species are two-brooded in the North, and some of them are three-brooded. The

story of a caterpillar of this latest brood is very interesting. It feeds on the tip of the leaf as described, but when about one-third grown it chooses a leaf and eats from the top about a third the way down. It then fastens the petiole of this leaf to the twig so that it will surely stay all winter; then covering the upper surface of the leaf with a film of silk it draws it together lengthwise above itself, making a tube just large enough to hold its precious person; it then lines this tube with silk. This is its winter home, and when done the caterpillar crawls into it head first, the warty last segment of the body fitting nicely the opening and making a living door; and there it remains until the first buds of spring call it out to a vernal breakfast.

In case of the species which are two-brooded the question is, How does this caterpillar know how to make this winter house? It does it while the summer is still warm, sometimes in August when there is no suggestion of cold or winter fasting. Its parents made no such house, and if it inherited the habit it must have been from its grandparents. This is one of the many mysteries of butterfly life which we with our coarse senses are not likely to fathom.

The Red-spotted Purple

Basilarchia astyanax (Bas-i-lar'chi-a as-ty'a-nax)

Plate XXVII, Fig. 3

The upper surface of the wings is velvety indigo-black tinged with blue or green. There are three rows of blue or green spots on the outer third of the hind wings; the spots of the inner row vary greatly in width in different individuals. On the lower surface there is a reddish orange spot in cell R + M of the fore wings, and one on the medial cross-veins; on the hind wings there are two orange spots similarly situated, a third at the base of cell R_1, and a row of seven spots just within a double row of submarginal blue or green spots.

Caterpillar.—Length one and one-half inches. The body is naked and humpy and bears various tubercles. In color it is mottled and streaked and blotched with brown and green and buff. The large tubercles on the second thoracic segment are thorny, and dark in color.

Food-plants.—Plum, thorn-apple, and other rosaceæ. However, it is a general feeder.

For beautiful and rich iridescence nothing can surpass the upper side of the wings of the red-spotted purple when it is flitting about in the sunshine. The front wings are velvety, reddish at the tips and purple black at the middle. The hind wings show a dark metallic green, while the triple rows of spots near the edge take on various hues of blue and green and purple. The under side of the wings is olive brown with rather con-

The Red-spotted Purple

Basilarchia astyanax (Bas-i-lar'chi-a as-ty'a-nax)

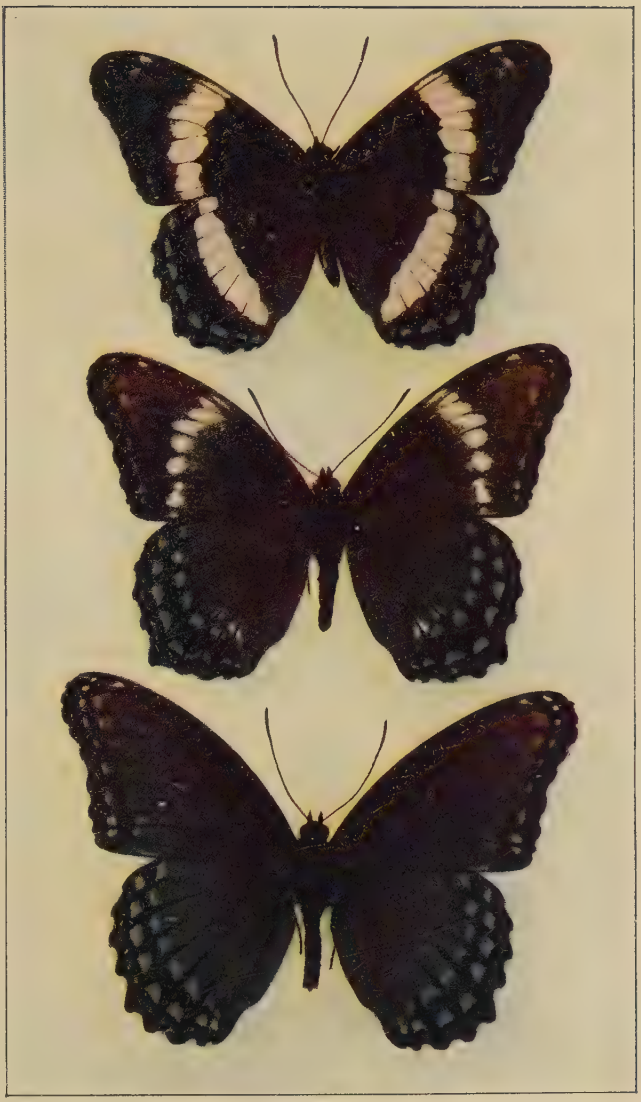
Plate XXVII, Fig. 3

PLATE XXVII

THE PURPLES

Fig.

1. The Banded Purple, *Basilarchia arthemis.*
2. The Hybrid Purple, *Basilarchia proserpina.*
3. The Red-spotted Purple, *Basilarchia astyanax.*



1

2

3

Plate XXVII.

ventional markings of red spots. It is somehow surprising to find the wings so rich above and so smooth and ordinary beneath; it reminds one of the right and wrong side of velvet. This sovereign loves shady roads, and is addicted to the refuse of the road, which, according to butterfly standards, is anything but waste material.

This species occurs throughout nearly the whole of the eastern United States. But it is not found in the northern parts of New England and New York.

> The butterfly the ancient Grecians made
> The soul's fair emblem, and its only name.
>
> COLERIDGE.

THE BANDED PURPLE

Basilarchia arthemis (Bas-i-lar'chi-a ar'the-mis)

PLATE XXVII, FIG. 1

The upper surface of the wings is velvety chocolate-black, marked with a conspicuous white bow extending from the middle of the costal margin of the front wings to near the anal angle of the hind wings. On the lower surface the wings are marked much as in the red-spotted purple with the addition of the white bow. Expanse of wings nearly three inches.

CATERPILLAR.—Length one and one-fourth inches; color of the body, various shades of green and greenish brown with a saddle of pale buff, almost white. Its body is naked and

humpy ; a large pair of spiny tubercles ornament the second thoracic segment.

Food-plants.—Birch, poplar, shadbush ; it prefers black birch.

We have had an intimate acquaintance with two individual banded purples. One haunted a road over which we passed frequently on our wheels. It is a beautiful road, bordered on one side by a high tree-covered bank, and on the other by a wide stream above the foaming waters of which the black and yellow birch love to lean. Every time we passed this spot we saw our banded purple spreading its white-banded, velvety wings in the patches of sunlight that filtered between the overhanging trees. It was always there and alone ; as we approached it would flutter up over our heads but soon returned to the preferred place. The other banded purple took up its abode on a side hill covered with young ash-trees and larches very near our house. This one was particularly fond of flying up among the branches of a chestnut oak, in front of a second story window where we could watch it at our leisure the while it moved briskly about on the leaves. It spent the entire summer basking on the ground and promenading on the leaves in the sunlight, and thus day by day grew into our thoughts and

finally into our affections. Mr. Scudder says when these butterflies are numerous they are very social, crowding against each other on moist ground much to the detriment of their handsome wings. Probably the species is rarer in our vicinity, for our experience has always been with lonely individuals who spent their whole lives within a radius of a few yards. While the broad, white band across the black velvety wings first attracts the eye to this species, the hind wings are beautifully iridescent with blue and green and often ornamented with dark red spots. On the under side of the wings the red spots and white bands show against a brown background. The species is double-brooded; and is essentially northern, being a Canadian species which extends a short distance into the northern part of the United States.

There he arriving, round about doth flie
From bed to bed, from one to other border;
And takes survey, with curious busie eye,
Of every flowre and herbe there set in order;
Now this, now that, he tasteth tenderly,
Yet none of them he rudely doth disorder,
Ne with his feete their silken leaves deface,
But pastures on the pleasures of each place.

SPENSER.

The Hybrid Purple

Basilarchia proserpina (Bas-i-lar'chi-a pro-ser'pi-na)

Plate XXVII, Fig. 2

There is a form of basilarchia which was described as a distinct species under the name *proserpina*, which is now believed by Scudder to be a hybrid between astyanax and arthemis, and by Edwards to be a dimorphic form of arthemis. This butterfly has the coloring of astyanax, with the addition of a portion of the white bow of arthemis. It occurs in a narrow belt of country extending from southern Wisconsin and northern Illinois eastward to the Atlantic coast of New England. It should be noted that this is the region which forms the southern limit of the range of arthemis and the northern limit of the range of astyanax, the place where the two species meet. The hybrid purple varies greatly.

The Viceroy

Basilarchia archippus (Bas-i-lar'chi-a ar-chip'pus)

Plate XXVIII, Fig. 2

The wings vary in color from a dull yellow orange tinged slightly with brown to a dark cinnamon color; they are bordered with black, and all the veins are edged with the same color. The fringe of the wings is spotted with white, and the black border on the outer margin contains a row of white spots.

Caterpillar.—Length about an inch; body humped and naked, with many tubercles. In color it is dark brownish yellow or olive green, with a pale buff or whitish saddle on the

Plate XXVIII.

middle segment of the abdomen. The tubercles on the second thoracic segment are club-shaped and spiny.

Food-plants.—Willow and poplar.

This species is remarkable for its resemblance to the monarch (*Anosia plexippus*). But aside from the structural characters separating the two subfamilies which these butterflies represent, the viceroy can be easily distinguished from the species it mimics by its smaller size, and by the presence of a transverse black band on the hind wings.

It is believed that the resemblance of these two species is not merely accidental, but is a result of the action of the law of natural selection. The butterflies of the family to which the monarch belongs, the milkweed butterflies, are exempt from the attacks of birds. It is supposed that this exemption is due to the possession by these butterflies of a disagreeable odor. With such an odor the conspicuous coloring of the butterflies is protective, the birds soon learning that such butterflies are not fit for food. And it can be seen that these birds will naturally leave undisturbed any other butterflies that resemble the ill-smelling ones, even though they do not possess a similar odor. According to the theory of natural selection these resemblances have been produced as

follows: In the case of a variable species that is unprotected by any disagreeable quality, any variation toward a protected species will tend to preserve the life of the individual possessing it. And in turn such offspring of these individuals as still more nearly resemble the protected species will be most likely to be preserved. The continued action of this natural selection will result in producing a species that closely resembles the protected one, even though it may be very different structurally from the one that it mimics.

Many instances of unconscious mimicry of this kind are known. They are especially abundant in the tropics where the foul-smelling heliconians are most abundant. The bad odor of these butterflies when living is so marked that it can be detected by the human nose; and it is found that many species of them are mimicked by other butterflies, and especially those of the Pieridæ. The mimicry is not confined to similarity in coloring, but extends to the shape of the wings and manner of flight.

The larva of the viceroy feeds upon willow, poplar, balm of gilead, aspen, and cottonwood. The species is two- or three-brooded, and hibernates as a partially grown larva in a nest made of a rolled leaf. This nest is lined with silk, and the

leaf is fastened to the twig with silk so that it can not fall during the winter. Mr. Scudder states that so far as is known to him all of the species of the sovereigns hibernate as larvæ in nests of this kind. It is worthy of note that only the autumn brood of caterpillars make these nests. So that the nest-building instinct appears only in alternate generations, or even less frequently when the species is more than two-brooded. *B. archippus* is found over nearly the whole of the United States as far west as the Sierra Nevada Mountains, and has been found sparingly even to the Pacific coast near our northern boundaries.

As *Anosia plexippus* has been termed the monarch, this species is aptly called the viceroy.

The Vice-reine

Basilarchia floridensis (Bas-i-lar'chi-a flor-i-den'sis)

Plate XXVIII, Fig. 4

This species closely resembles the viceroy, *B. archippus*, except that it is of a much darker color. It is found in Georgia and Florida, and is supposed to mimic the queen, *Anosia berenice*, hence the popular name suggested above.

THE EMPERORS

The butterflies of this group are found chiefly in the southern part of our country. The three most common species can be separated as follows:

A. Apex of fore wings strongly falcate; hind wings tailed. (*A. andria*), p. 177. THE GOATWEED EMPEROR.

AA. Wings neither falcate nor tailed.

B. Front wings with a brown eyelike spot in cell Cu_1. (*C. celtis*), p. 174. THE GRAY EMPEROR.

BB. Front wing without a brown eyelike spot. (*C. clyton*), p. 175. THE TAWNY EMPEROR.

THE GRAY EMPEROR

Chlorippe celtis (Chlo-rip'pe cel'tis)

PLATE XXIX, FIG. 1, 3

In this and the following species the apex of the front wings and the anal angle of the hind wings are considerably produced in the males, but more rounded in the females. The club of the antennæ is quite broad and distinct. In this species the wings are russety brown marked with blackish brown. There is a submarginal row of six eyelike spots on the hind wings and one in cell Cu_1 of the fore wings. In the fore wings there are also two brown spots and a bar in cell R + M. The front wings are also crossed by two irregular rows of white spots. Expanse of wings about two inches.

CATERPILLAR.—Length one and one-fourth inches. The green face has four paler green stripes on it; there are spines at the side and two long forked tubercles on the top of the head. The body is naked, yellowish green above and bluish green at the sides.

Food-plant.—Hackberry.

The gray emperor resembles the tawny emperor quite closely, except that it is smaller and

PLATE XXIX

THE EMPERORS

Fig.

1. The Gray Emperor, Chlorippe celtis, female.
2. The Tawny Emperor, Chlorippe clyton, male.
3. The Gray Emperor, Chlorippe celtis, male.
4. The Tawny Emperor, Chlorippe clyton, female.
5. The Goatweed Emperor, Anæa andria, female.
6. The Goatweed Emperor, Anæa andria, male.

PLATE XXIX

THE EMPERORS

Fig.
1. The Gray Emperor, *Chloripe celtis*, female.
2. The Tawny Emperor, *Chloripe clyton*, male.
3. The Gray Emperor, *Chloripe celtis*, male.
4. The Tawny Emperor, *Chloripe clyton*, female.
5. The Goatweed Emperor, *Anæa andria*, female.
6. The Goatweed Emperor, *Anæa andria*, male.

Plate XXIX.

duller in color and more slender and graceful in shape. It is a long-lived butterfly and may be found during the entire season. The caterpillar is similar in habit to that of the goatweed emperor. It lines the upper surface of the leaf with silk, causing it to roll up, making a more or less secure nest.

The gray emperor is partially double-brooded. Some of the caterpillars of the first brood finish their growth in a great hurry and change to adults, while others of the same brood dawdle along and hibernate. The species extends from southern Pennsylvania, Ohio, and Illinois southward.

Lastly his shinie wings as silver bright,
Painted with thousand colors passing farre
All painters' skill, he did about him dight:
Not halfe so manie sundrie colours arre
In iris bowe; ne heaven doth shine so bright,
Distinguished with manie a twinckling starre;
Nor Junoes bird, in her ey-spotted traine,
So many goodly colours doth containe.

SPENSER.

THE TAWNY EMPEROR

Chlorippe clyton (Chlo-rip'pe cly'ton)

PLATE XXIX, FIG. 2, 4

This species agrees with the preceding in the structural features mentioned above. The wings are more or less

obscure tawny, marked with blackish brown, and with pale spots. The arrangement of the spots is similar to that in the preceding species, except that the outer spot in cell Cu_1 of the fore wings is not brown and eyelike. Expanse of wings two to three inches.

The species is dimorphic ; the dimorphism affects both sexes and is independent, so far as is known, of season, as there is only one brood each year. The typical form, *Chlorippe clyton clyton*, has a submarginal row of six eyelike spots on the hind wings. The second form, *Chlorippe clyton proserpina*, differs in having the hind wings darker and the submarginal row of eyelike spots wanting.

CATERPILLAR.—Length one and one-half inches. Head pale green with spines along the sides and two large branched tubercles on top. Body naked, with green, yellow and white stripes extending from head to forked tail.

Food-plant.—Hackberry.

The tawny and gray emperors must belong to a different dynasty than does the goatweed emperor, for they resemble the latter in no particular to the unpractised eye. The front wings of the tawny resemble those of the fritillaries, and its hind wings remind one of the meadow-browns. There is one form of the tawny emperor that has the upper side of the hind wings almost solidly brown.

The eggs are laid closely packed on a leaf, and the caterpillars when they first hatch arrange

themselves side by side in a compact row; and beginning at the tip of a leaf eat backward, leaving behind them nothing but the hard, tough ribs. They are quite luxurious young princes and make silken paths for themselves wherever they go. After the third molt the eating class is broken up and each member goes off boldly and without concealment to try its fortune alone; at this stage it is a royal-looking caterpillar, and has a pair of antlers on its head that are truly magnificent.

The tawny emperor belongs to the South, although it has been found as far north as Ohio. It has only one brood per year, and the caterpillars when about half grown hibernate on the ground among the fallen leaves.

The Goatweed Emperor

Anæa andria (A-næ'a an'dri'a)

Plate XXIX, Fig. 5, 6

This butterfly is sharply distinguished from all other butterflies found in our fauna by the striking form of its wings. The wings of the male are rich dark orange margined with brown; those of the female are paler orange margined with brown, and with a very irregular, transverse, broad, pale band crossing both wings, and edged on either side with dark brown.

CATERPILLAR.—Length one and one-half inches. Color grayish green covered with many raised points. The head is gray green ornamented at the sides with small tubercles which are a little larger on the crown.

Food-plant.—Goatweed.

Butterflies are like people in many important particulars. One of these points of similarity is that some of them attract us and some repel, and we can not explain why. A case in point is the goatweed emperor; though it has handsome orange-red wings banded with yellow and margined with brown, and has the tips of the front and hind wings extended in graceful points, yet the authors of this book in a confidential moment confessed to each other that they had never liked this butterfly; and both agreed that they would rather have on their premises one impudent, meddling American copper than all the goatweed emperors in the world; and yet, perhaps it is hardly fair to bias public opinion by expressing such an unreasonable prejudice in print.

The caterpillar, like those of the sovereigns, at first eats the tip of the leaf, leaving the midrib on which it rests. Later it spreads a silken mat on the upper surface of a leaf, drawing the edges together above it; hiding in this nest it proceeds

to eat away the base of the leaf until it has actually eaten itself "out of house and home"; then it moves on to another site and goes through a like performance. When nearly grown it seems to gain wisdom, and late in the afternoon it often leaves its home temporarily and feeds on neighboring leaves. The goatweed butterfly is found in the Western States from Illinois to Texas. It is double-brooded, and hibernates as a butterfly.

When chirping crickets fainter cry
And pale stars blossom in the sky,
And twilight's gloom had dimmed the bloom
And blurred the butterfly.

JAMES WHITCOMB RILEY.

FAMILY V

THE MEADOW-BROWNS

Family Agapetidæ (Ag-a-pet'i-dæ)

This family includes chiefly brown butterflies whose markings consist almost entirely of eyelike spots. Some Western

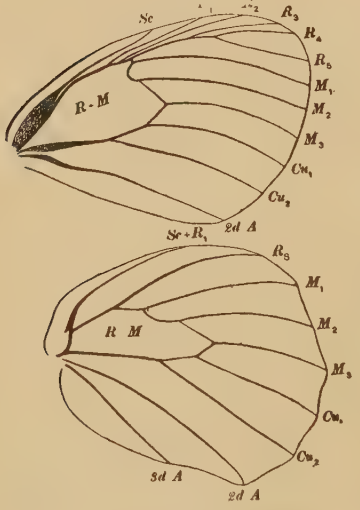


FIG. 36.—Venation of the wings of *Cercyonis alope*.

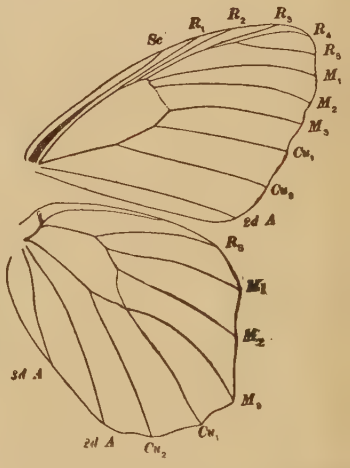


FIG. 37.—Venation of the wings of *Enodia portlandia*.

species, however, are bright-colored. Our forms can be easily recognized by their having some of the veins of the fore wings greatly swollen at the base (Fig. 36).

The larvæ are cylindrical, tapering more or less toward each end. The caudal segment is bifurcated, a character that

distinguishes them from all other American butterfly larvæ excepting those of some of the emperors (*Chlorippe*).

The chrysalids are rounded; in some cases the transformation takes place beneath rubbish on the ground without any preparation of cell or suspension of the body.

Nearly fifty species have been described from America north of Mexico. The more common species of the East are described below and can be separated by the following table:

A. Eyes very hairy; veins M_3 and Cu_1 of the hind wings arising together at the apex of cell R + M (Fig. 37).

B. Outer margin of hind wings angled at the end of vein M_3 (Fig. 37). (*E. portlandia*), p. 189. THE PEARLY EYE.

BB. Outer margin of hind wings evenly rounded. (*S. canthus*), p. 191. THE EYED BROWN.

AA. Eyes naked or nearly so; veins M_3 and Cu_1 of the hind wings arising separately, vein Cu_1 arising before the apex of cell R + M (Fig. 36).

B. Upper surface of the fore wings with eye-spots.

C. Upper surface of hind wings usually with two large eye-spots, one each in cells M_1 and Cu_1 and sometimes a smaller one in cell Cu. Expanse of wings about one and one-half inches. (*C. eurytus*), p. 197. THE LITTLE WOOD-SATYR.

CC. Upper surface of hind wings either without spots or with a small one in cell Cu_1. Expanse of wings two inches or more.

D. Large species, expanding two and one-half inches; eye-spots of fore wings on an orange-yellow band. (*C. pegala*), p. 188. THE SOUTHERN WOOD-NYMPH.

DD. Smaller species, expanding from two to two and three-eighths inches. (*C. alope*).

E. Eye-spots of fore wings enclosed in a common, perfectly distinct pale yellow band. (*C. alope alope*), p. 185. THE BLUE-EYED GRAYLING.

EE. Eye-spots of fore wings enclosed in a very indistinct common pale band or none at all. (*C. alope nephele*), p. 185. THE DULL-EYED GRAYLING.

EEE. Eye-spots of fore wings on upper surface enclosed in yellow rings or each on a yellow spot, p. 185. HYBRID GRAYLINGS.

EEEE. Eye-spots of the fore wings on a reddish yellow band. (*C. alope maritima*), p. 185. THE SEA-COAST GRAYLING.

BB. Upper surface of fore wings without eye-spots.

C. Lower surface of hind wings mottled but without distinct spots; an alpine species found in the White Mountains. (*Œ. norna*), p. 193. THE WHITE MOUNTAIN BUTTERFLY.

CC. Lower surface hind wings with distinct spots.

D. Upper surface of hind wings with indistinct blackish spots near the outer margin. (*N. gemma*), p. 194. THE GEMMED BROWN.

DD. Upper surface of hind wings without spots.

E. Eye-spots on the lower surface of hind wings elongate. (*N. phocion*), p. 196. THE GEORGIAN SATYR.

EE. Eye-spots on the lower surface of the hind wings circular. (*C. sosybius*), p. 199. THE CAROLINIAN SATYR.

To the one who delves in butterfly literature it is apparent that the writers evince an interest which borders on affection for the meadow-browns—a personal attitude not accorded to many species far more beautiful in color and in form. This sentiment is expressed first of all in a delightful nomenclature, which appeals to the imagination. Wood-nymphs, satyrs, graylings, and meadow-browns are the various names given to these butterflies whose dull-colored wings are diversified rather than ornamented with blackish eye-spots. Perhaps this favoritism is due to the interesting places where they are found ; for they haunt the open woods and grassy glades and meadows that are fringed with forest mantle and fly aimlessly up and down peaceful bramble-bordered lanes. Their flight Mr. Scudder aptly describes as of peaceful, wavering, dancing character, and not sustained. Their colors are so inconspicuous that they naturally seek protection in hiding rather than in strong flight.

The caterpillars feed only by night ; they are sluggish, and trust to their coloring and form for protection. Their color resembles that of the food-plant ; the body tapers smoothly from the middle toward each end, the forked tail lying close to the leaf or stem, making the insect seem to be

a swollen portion of blade or stalk of grass or sedge rather than a thing apart.

The satyrs are everywhere on the globe where butterflies may live. They have some interesting habits similar to those of moths. A few species are known that pass the chrysalis stage in the ground in a cell made of earth and silk; and several species fly mostly in the twilight.

The interest which the wood-nymphs arouse in the nature lover is something that must be felt rather than described. It is safe to say that the degree of pleasure experienced by startling from its covert a low-flying grayling may be safely regarded as a measure of the height attained by the butterfly connoisseur.

> Flusheth the rise with her purple favor,
> Gloweth the cleft with her golden ring.
> 'Twixt the two brown butterflies waver,
> Lightly settle, and sleepily swing.
>
> JEAN INGELOW.

THE GRAYLING

Cercyonis alope (Cer-cy'o-nis al'o-pe)

PLATE XXX, FIG. 1, 2, 3, 4

This species is found from the Atlantic to the Pacific; it occurs under several forms, some of which have been described as distinct species. The most common forms found east of

Plate XXX.

sedge rather than a thing apart.

are known that pass the chrysalis stage in the ground in a cell made of earth and silk; and several species fly mostly in the twilight.

PLATE XXX

THE MEADOW-BROWNS

Fig.

1. The Blue-eyed Grayling, *Cercyonis alope alope*, male.
2. The Blue-eyed Grayling, female.
3. The Dull-eyed Grayling, *Cercyonis alope nephele*, female.
4. The Dull-eyed Grayling, male.
5. The Little Wood-satyr, *Cissia eurytus*, male.
6. The Little Wood-satyr, female.

Flusheth the rise with her purple favor,
Gloweth the cleft with her golden ring,
'Twixt the two brown butterflies waver,
Lightly settle, and sleepily swing.

JEAN INGELOW.

THE GRAYLING

Cercyonis alope (Cer-cy'o-nis al'o-pe)

PL. XXX, FIG. 1, 2, 3, 4

This species is found from the Atlantic to the Pacific; it occurs under several forms, some of which have been described as distinct species. The most common forms found east of

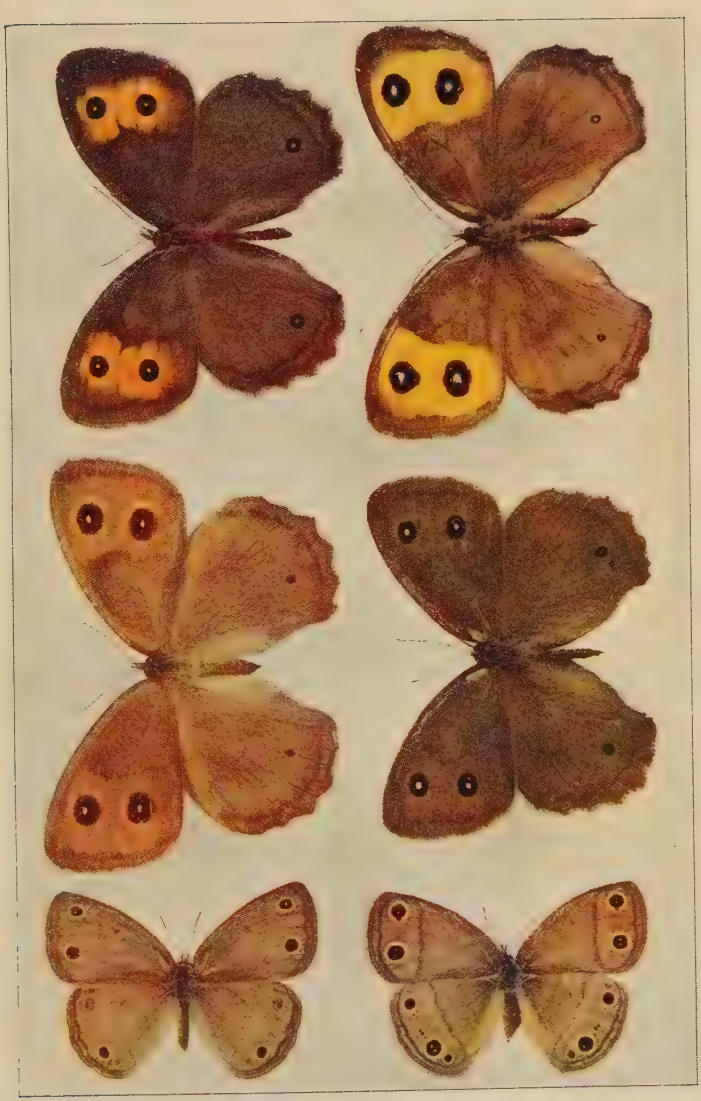


Plate XXX.

the Rocky Mountains are the first two described below and intergrades between these. Expanse two to two and one-half inches.

(1) The Blue-eyed Grayling, *Cercyonis alope alope*.—The upper surface of the wings is dark brown ; on the outer half of the fore wings there is a distinct yellow band, which extends from vein R_6 to the anal vein ; in this band there are two dark spots with a white or bluish centre. The hind wing usually bears a small spot in cell Cu_1, which is narrowly rimmed with yellowish and has a minute white pupil. The lower surface of the hind wings is either with or without eye-like spots, usually with six of them.

This is a Southern form, which extends into the southern portions of New England, New York, Michigan, Wisconsin, Iowa, and Nebraska ; and into the northern portions of Illinois, Indiana, and Ohio.

(2) The Dull-eyed Grayling, *Cercyonis alope nephele*.—In this form the yellow band of the fore wings is either absent or represented by a faint pallid cloud. In other respects it closely resembles the blue-eyed grayling.

This is a Northern form ; the southern limits of its range overlaps the northern limits of the range of the blue-eyed grayling as given above.

(3) Hybrid Graylings.—In that narrow belt where the ranges of the two forms of Cercyonis alope described above overlap, all variations between the two types occur. In most of these intergrades the eye-spots of the upper sides of the fore wings are surrounded by yellowish rings, or each is on a yellowish patch.

(4) The Sea-coast Graylings (*Cercyonis alope maritima*). —In a narrow belt along the Atlantic coast there occurs a

form which is smaller than those described above, and of a dark color; this form is easily recognized by the color of the band bearing the eye-spots on the fore wings, it being reddish yellow.

CATERPILLAR.—Length one and one-third inches. Green in color with two lighter green or yellowish lengthwise stripes along each side. The body is covered with down but is otherwise naked. The slender tail ends in a shallow fork.

Food-plant.—Grass.

The Blue-eyed Grayling.—The blue eyes of this grayling are rather disappointing, partly because they are mere dots in the large black eye-spots, scarcely noticeable from above, and partly because they are usually lavender instead of blue; however, on the lower sides of the wings the blue eyes are well worth looking at. Above and below the blue iris has a pupil of white at its center. The first thing that attracts the eye to this butterfly is never blue eyes, but rather the large yellow band on the outer half of the front wing against which the round black spots, each a true "bull's-eye" in its appearance, shows off to great advantage.

The blue-eyed grayling is most careless as to the number of its decorations. Usually two eye-spots on the front wing are reproduced with large blue centers on the lower side; but one of our specimens shows these ocelli with white

centers; and one shows a small, solidly dark spot above for the hind ocellus, which does not appear at all on the under side. Some individuals show one small light-centered spot on the hind wing above; others show none at all. Some have a zigzag row of six blue-centered eye-spots of varying sizes on the lower side of the hind wing, and others show only two, and they are obscure.

This satyr is a lover of lonely lanes and bramble-covered walls and fences as well as of the open woods. Its taste is like Lucy Larcom's:

> I like the flowers that you call weeds,
> Sedge, hardhack, mullein, yarrow,
> That knit their roots and sift their seeds
> Where any grassy wheel-track leads
> Through country byways narrow.

Mr. Edwards has observed that the blue-eyed grayling loves to visit the hardhack flowers in the East and the tickseed on the plains of the West. The species is single-brooded. The caterpillar hibernates as it hatches from the egg, a minute speck of life to endure the cold of winter. When a caterpillar rests upon a stem of grass it is quite invisible to any save the keenest eye.

The Dull-eyed Grayling.—This form has eyes quite as bright as those of the blue-eyed grayling, only they are usually not so large and they

lack the yellow background to give them prominence; the eye-spots on the lower side of the hind wings are inconspicuous, and often only two of the normal six appear. It is simply a Northern variety of the blue-eyed grayling, a variety grown dull under the clouds of Northern skies.

The hybrid graylings are the progeny of the yellow-banded beauty of the South and the sad-colored Puritan of the North. The result is a most interesting mixture and variation. In a box of well-arranged specimens it is impossible to tell where the Northern variety begins or the Southern variety ends. Perhaps in the course of eons the blue-eyed and dull-eyed graylings may become estranged and no longer interbreed; then the entomologist of the future will say "these species are quite distinct," and if he is like some entomologists of to-day he will add, "and they always were distinct."

The Southern Wood-nymph

Cercyonis pegala (Cer-cy'o-nis peg'a-la)

This species closely resembles the typical form of *Cercyonis alope*, the blue-eyed grayling, but is larger, and the yellow band of the fore wings is orange-yellow.

The larva is said to be gray, with one broad and one narrow white band. The food-plant is coarse wild grass.

The Southern wood-nymph seems to be another illustration of the exuberance of growth and color under the warmth of the southern sun. It is the giant of the family, having an expanse of nearly three inches. The male has only one eye-spot, set in the yellow band of the front wings, but the female has two and looks very like an overgrown blue-eyed grayling of which it is supposed by some to be a Southern variety. It loves the pine barrens of Florida and the Gulf States.

The Pearly Eye

Enodia portlandia (E-no'di-a port-lan'di-a)

Plate XXXI, Fig. 1, 2

The upper surface of the wings is soft clay brown, the outer third a little paler; on the fore wings there is a nearly straight row of from three to five black ocelli in cells R_5 to Cu_1, that in cell R_5 often obsolete; on the hind wings there is a curving row of five spots in cells R_5 to Cu_1. On the lower surface the eye-spots are much more distinct, and there may be an additional one in cell Cu of each wing; in the hind wing this ocellus is double; the ocelli of the front wing are enclosed by a pale line; on the hind wings the ocelli in cell R_5 and in cell Cu are each enclosed by a similar line, and the remaining four ocelli are enclosed by a common wavy line. Expanse two and one-fourth inches.

Caterpillar.—Length one and one-fourth inches. It is downy, and striped lengthwise with varying shades of green.

It bears on its head a pair of horns as long as the head is wide, and a longer pair extends backward from the last segment of the body; both pairs are tipped with red.

Food-plant.—Grass.

The pearly eye, clad in fawn-colored satin ornamented with oblong medallions of seal-brown velvet, is, from the point of view of the modiste, the most beautiful of our American satyrs. The oval velvet patches of varying sizes, three on the front wing above and five on the hind wing, are surrounded each by a pale circle that enhances the rich color. These same solid brown spots when translated into the lower surface of the wings have white dots at their centers and are margined with pale and darker outer circles and are all set in a band of shining, iridescent lilac, especially beautiful on the hind wings. Not only are the brown spots more elaborate on the lower surface, but they are more numerous, there being usually four or five on the front and six on the hind wings.

The pearly eye is seen at its best in the Southern States east of the Rockies, though it is found less numerously in the north as far as Manitoba and Nova Scotia. In the northeastern States it seems to be limited to certain localities. It is essentially a forest insect, and each butterfly seems

Plate XXXI.

PLATE XXXI

THE MEADOW-BROWNS

Fig.

1. The Pearly Eye, *Enodia portlandia*, male.
2. The Pearly Eye, female, lower side of wings.
3. The Eyed Brown, *Satyrodes canthus*, female.
4. The Eyed Brown, male, lower side of wings.
5. The White Mountain Butterfly, *Œneis norna*.
6. The Gemmed Brown, *Neonympha gemma*.
7. The Carolinian Satyr, *Cissia sosybius*, lower side of wings.
8. The White Mountain Butterfly, lower side of wings.
9. The Gemmed Brown, lower side of wings.
10. The Georgian Satyr, *Neonympha phocion*, lower side of wings.

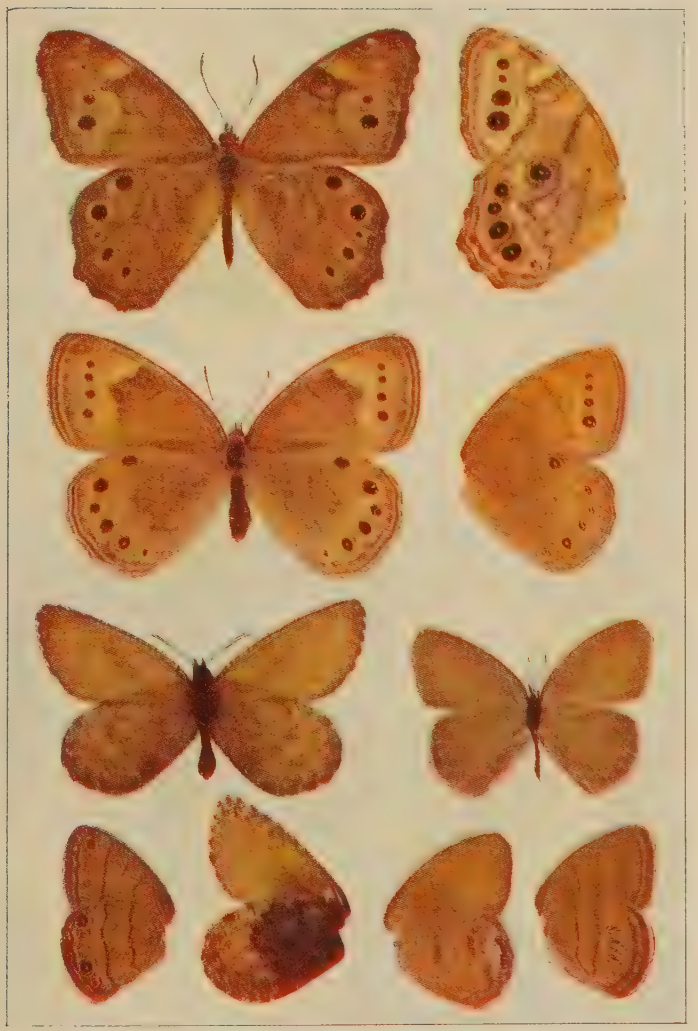


Plate XXXI.

to select some tree for its abiding-place. It alights on the trunk head downward, or perhaps suns itself on the upper leaves. From this "home base" it makes sallies into the air to indulge in a wrestling match with one of its fellows for a little time and then returns to its chosen spot.

The caterpillar has on either end of the body red-tipped "horns," and one wonders if this is perchance an advantage, and if so, why. The species winters in the larval stage. The caterpillar attains part of its growth in the fall and completes it in the spring after the grass starts. In the South the pearly eye is double-brooded.

The butterflies—bright, airy things—
From off the lilac buds
I scared, for having on their wings
The shadows of the woods.

ALICE CARY.

THE EYED BROWN

Satyrodes canthus (Sat-y-ro'des can'thus)

PLATE XXXI, FIG. 3, 4

The upper surface of the wings is soft mouse brown on the basal half and paler beyond, considerably so in the female; front wings with a nearly straight row of four, roundish, black spots in cells M_1 to Cu_1; hind wings with a curving row of six eye-spots in cells R_5 to Cu; the spot in cell Cu is sometimes very small, and those in cells R_5 and M_1 are fre-

quently blurred. On the lower surface the ocellate spots are more distinct. Expanse two inches or more.

CATERPILLAR.—Length one and one-fourth inches; body downy and striped lengthwise with shades of green. The head and hind segments of the body are adorned with a pair of red cone-shaped tubercles.

Food-plants.—The coarser grasses and sedges.

This delicate-winged fawn-colored butterfly looks much like a pale little sister of the pearly eye. Its velvety brown spots are almost the same in color and arrangement on the wings except that the upper surface of the front wing usually shows four spots instead of three, as is ordinarily the case with the pearly eye. In the eyed brown the last large spot on the upper surface of the hind wing has a center of white. On the lower surface the white centers of all the eye-spots are much larger in proportion than in the pearly eye, each covering one-third of the diameter of the brown circle; and the band on which the eye-spots are set is yellow instead of lilac.

The eyed brown is a northern species belonging especially to the middle West. It is found in Canada and is not rare in New England. For many years, and also in many books, the species is called *eurydice;* but Orpheus has evidently found another Eurydice among the butterflies, a

daughter of the sunlight instead of the shades, and this one now disports itself under the name of *canthus*. It is single-brooded, and winters as a partially grown caterpillar. The habits of the family are disregarded by this caterpillar, since it feeds by day; when it rests it arranges itself so that its red "horns" project straight out in front and behind, and are thus directed to the foe at the front or at the rear.

The White Mountain Butterfly

Œneis norna (Œ-ne'is nor'na)

Plate XXXI, Fig. 5, 8

The upper surface of the wings is grayish brown, without spots, except sometimes a minute one in cell M_1 of the fore wings; the fringe of the wings is brownish white interrupted with blackish brown at the ends of the veins. On the hind wings the marbling of the lower surface shows through somewhat. On the lower surface the tip of the fore wings and the greater part of the hind wings are beautifully marbled with blackish brown and grayish white. Expanse one and three-fourths inches.

The larva feeds upon *Carex vulgaris* var. *hyperborea*. The species is either single-brooded or requires two years for the development of a brood.

It is very remarkable in its distribution. It

is an Arctic species, but is found also on the higher parts (above 5,000 feet) of the White Mountains and among the Rocky Mountains of Colorado.

These two widely separated colonies of this butterfly are believed to be the remnants of an arctic fauna, which was forced southward during the Ice age. At the close of this period, as the arctic animals followed the retreating ice northward, the tops of these mountains became colonized by the cold-loving forms. Here they found a congenial resting-place; while the main body of their congeners, which occupied the intervening region, was driven northward by the increasing heat of the lower land. And here they remain clinging to these islands of cold projecting above the fatal sea of warmth filling the valleys below.

The Gemmed Brown

Neonympha gemma (Ne-o-nym'pha gem'ma)

Plate XXXI, Fig. 6, 9

The upper surface of the wings is a moderately dark mouse brown, with two darker shades beyond cell R + M of the hind wings and with indistinct blackish spots near the outer margin of the hind wings. The lower surface is gray brown; the fore wings are crossed by three fine transverse threads; on

the middle of the outer surface of the hind wings there is a large oval patch composed of white and reddish-brown scales; in the outer edge of the patch are four rounded cinnamon-brown spots, heavily flecked with white scales. Expanse of wings one and one-fourth to one and three-eighths inches.

CATERPILLAR.—Color of body green or brown marked with darker lengthwise stripes. The tubercles on the head and last segment of the abdomen are long.

Food-plant.—Grass.

Some butterflies, like some people, are more remarkable for what they are not than for what they are. This is true of the gemmed brown when seen from above; for it is just a little plain, mouse-brown butterfly, and that is all. But on the lower side of the hind wings we find where this little Quaker keeps the gems that give it its name; near the margin are four small sepia-brown spots with shining centers set in ivory, bordered outside with pearl that shimmers and gleams with a luster almost metallic. The thrill of surprise one feels in discovering this exquisite decoration on such a dull insect is one of the experiences that renders the work of the butterfly lover never monotonous.

The gemmed brown is a Southern species ranging from Mexico to Virginia. It is double-brooded; the caterpillars of the spring brood are green, while those of the fall brood are brown in

color. That these colors are adapted for protection during the respective seasons in which they occur is obvious. But we still wonderingly question, "How does this caterpillar know when to be green and when to be brown?"

The Georgian Satyr

Neonympha phocion (Ne-o-nym'pha pho'ci-on)

Plate XXXI, Fig. 10

The upper surface of the wings is mouse brown, without ocellate spots, and with the submarginal lines faint. The lower surface is slightly paler, and has four transverse dark yellow lines, two near the center of the wing and two submarginal; these are more distinct on the hind wings. The ends of the second and third of these lines on the hind wings meet, forming a large oval space enclosing four elongated eye-spots. Expanse of wings one and one-fourth to one and one-half inches.

Caterpillar.—Color, yellow striped with green; head pea-green with brownish tubercles; the anal tubercles are reddish.

Food-plants.—Coarse grasses.

The Georgian satyr is smaller and quite as dull colored above as is the gemmed brown. Its wings are wide for their length, and there is a hint of reddish tinge on the upper side. In this species the gems are carried on the lower side of the wings just outside the middle and may be

easily seen with a lens; they consist of four elongated spots of cut steel set in pale straw-colored borders encompassed by bands of rust yellow.

This is a Southern species. Abbot says he found it common in Georgia "in oak and pine woods on the sides and branches of the trees," and it extends as far north as New Jersey.

The Little Wood-satyr

Cissia eurytus (Cis'si-a eu'ry-tus)

Plate XXX, Fig. 5, 6

The upper surface of the wings nearly uniform dark brown, the outer third sometimes a little paler; each wing with two eye-spots situated in cells M_1 and Cu_1; the small pupils often double. On the hind wings the eye-spot in cell M_1 is often obsolete, and there is sometimes an accessory one in cell Cu; the outer margin and two submarginal lines dark. The lower surface is rather pale gray brown, with the outer margin and four transverse lines brown; eye-spots as above, also with one in cell R_5 of the hind wings, and rudiments of one in cells M_2 and M_3. Expanse of wings about one and one-half inches.

Caterpillar.—Body downy and pale greenish brown in color, with brownish or blackish lengthwise stripes. The head and its tubercles are whitish. The tubercles on the rear end of the body are of the same hue.

Food-plant.—Grass.

This lively butterfly is as jolly as a little wood-satyr ought to be. It has a skipping, dancing, care-free flight, never rising far over the ground. Like a true satyr, it loves the shade of thickets and groves. The two round spots are very noticeable at the front outer angles of the upper side of the wings, although those on the hind wings are often obscure. A peculiar thing about any one of these eye-spots is that when looked at directly from above it seems solid, but when looked at from an angle it shows a double pupil of metallic sheen. On the lower surface of the wings all the eye-spots have these twin pupils, and between the spots are patches of shining, reddish gold—a gold with much alloy, but which nevertheless makes an exquisite adornment.

The little wood-satyr is single-brooded and appears early in the season. In the South the butterfly appears as early as March, but in the North we do not see it until late in May or the first of June. The caterpillar feeds by night, and hides during the day among the roots and bases of the grass where its shape and color protect it from the eyes of prowling foe; it hibernates when partly grown. It is always sluggish in its movements and in this respect forms a strong contrast to the sprightly butterfly.

THE MEADOW-BROWNS

The Carolinian Satyr

Cissia sosybius (Cis'si-a so-syb'i-us)

Plate XXXI, Fig. 7

Upper surface of wings a rich dark brown, the outer margin marked with a black thread preceded by a more or less obscure narrow pallid stripe, more distinct on the hind wings than on the fore ; both wings without eye-spots. Lower surface paler ; the median area of each wing is enclosed between two transverse brown lines ; the outer margin is brown, and there are two submarginal brown lines, the inner one wavy ; the outer area of each wing with a row of more or less distinct eye-spots, five on the fore wing and six on the hind wing ; these vary in distinctness ; that in cell M_1 of the fore wing, and those in cells M_1, Cu_1 and the second anal cell of the hind wings are the more prominent. Expanse of wings one and one-fourth to one and one-half inches.

Caterpillar.—Body striped lengthwise, yellowish on the back and bluish green on the sides. The tubercles are pronged.

Food-plant.—Grass.

The Carolina satyr sometimes has barely a suggestion of spots on the upper surface of its wings, which are usually dull mouse brown. The lower surface of the wings, however, shows a close resemblance to the little wood-satyr, although there is only one tiny eye-spot at the apex of the front wing ; each hind wing has two good-sized ocelli widely separated and the hind one has a

tiny fellow just at its inner side. These spots are dark brown with centers of mother-of-pearl, the beauty of which needs a lens for its revealing. Between the spots on the hind wing may be seen just a trace of the red gold that is found in similar position on the little wood-satyr.

The species is double-brooded; it is found from the southern part of the Middle States southward and in the Mississippi Valley.

O languorous lilac! still in time's despite
I see thy plumy branches all alight
With new-born butterflies, which loved to stay
And bask and banquet in the temperate ray
Of spring-time, ere the torrid heats should be.

ELIZABETH AKERS.

FAMILY VI

THE HELICONIANS

Family Heliconidæ (Hel-i-con'i-dæ)

This family consists chiefly of tropical butterflies ; a single species, however, extends into the United States. The heliconians are of medium or rather large size ; they have narrow and elongate fore wings, which are usually more than twice as long as broad. The fore legs are very feebly developed in both sexes. The following is our only species.

The Zebra

Apostraphia charithonia (Ap-o-stra'phi-a char-i-tho'ni-a)

Plate XXXII, Fig. 1

Wings black, banded with lemon yellow, as follows: On the front wings a curved band arises at the base, follows the cubitus, and extends about three-fourths the length of cell Cu_1 ; a second band arises near the costal margin, crosses the apex of cell R + M, and extends to near the end of cell M_2 ; there is a third transverse band near the apex of the wing. On the hind wings there is a broad band parallel with the front wings when they are spread, a submarginal row of about fifteen spots, and a row of dots on the outer margin near the inner angle. Expanse of wings two and one-half to four inches.

Caterpillar.—Greenish white in the earlier stages and porcelain white in the last stage, with transverse markings of

brown or black spots and six longitudinal rows of long, black, bristly spines.

Food-plant.—Passion-vine.

The zebra with its long, narrow, black, velvety wings banded with lemon yellow is indeed a tropical-looking creature. On the wings beneath, the markings above are repeated in lemon and cream-white with the addition of a peach-blossom colored blotch at the tip of the hind wing and some vermilion spots on both wings near the bases. Its pallid, spiny caterpillars are found on the passion-flower from Florida to South Carolina; in their later stages they hide during the day and feed by night. The butterflies come out of the protecting forest in the morning to enjoy the hot sunshine in the open field, but when disturbed they take to the woods again with all expedition; at night they rest in flocks on the Spanish moss or on the dead twigs, where they hang head up with wings closed over the back. The chrysalis is a peculiar-looking object and very pretty. It is angular in outline, and has two leaf-shaped projections on its head and numerous points and spines tipped with gilt. The maiden zebra is much wooed, for her lovers cling in numbers to her chrysalis before she emerges, anxiously waiting her début into the winged world. The

zebra possesses some of the *nauseating* qualities of the monarch, and is never eaten by birds, lizards or monkeys.

Do you know the pile-built village where the sago-dealers trade?
Do you know the reek of fish and wet bamboo?
Do you know the steaming stillness of the orchid-scented glade
When the blazoned, bird-winged butterflies flap through?

KIPLING.

FAMILY VII

THE MILKWEED BUTTERFLIES

Family Lymnadidæ (Lym-nad'i-dæ)

These are butterflies of large size, with rounded and somewhat elongated wings, the apical portion of the fore wings being much produced. The apparent absence of scales on the antennæ is the most available character for distinguishing these insects. Only three species occur in our fauna; and one of these does not extend north of Florida.

The Monarch

Anosia plexippus (A-no'si-a plex-ip'pus)

Plate XXXII, Fig. 3, *male;* Plate XXVIII, Fig. 1, *female;* Plate I, *transformations*

The upper surface of the wings is light tawny brown, with the borders and veins black, and with two rows of white spots on the costal and outer borders. In the male the veins of the wings are more narrowly margined with black, and there is a black pouch next to vein Cu_2 of the hind wings, containing scent-scales or androconia.

Caterpillar.—Length nearly two inches; head yellow striped with black; body white with narrow black and yellow cross stripes on each segment. On the second thoracic segment there is a pair of black whiplash-like filaments. On the eighth abdominal segment is a similar pair, but shorter.

Food-plant.—Milkweed.

Plate XXXII.

The male monarch is the dandy among butterflies *par excellence.* He is not only trig in figure and gorgeous in color, but on each hind wing he carries a black sachet bag for the allurement of his lady-love. And she is as brilliant as he, but lacks the perfume pockets. "I am monarch of all I survey" is exemplified in the confident, serene flight of this butterfly; the species is nauseous to birds in both the caterpillar and adult stages, and by their bold actions they show the result of this immunity. But the monarchs have other problems of their own just because the bird problem is eliminated; for undisturbed they spread and flourished in their native tropic America until it became a question of sufficient food-plants to nourish their numerous progeny. Because of this they began pushing farther north and south during the seasons of plant growth. As they could not endure the northern winter they came north for the summer and went back in the autumn. This northern migration is accomplished thus: the mother butterfly follows the spring northward as it advances as far as she finds milkweed sprouting; there she deposits her eggs, from which hatch individuals that carry on the journey, and in their turn lay their eggs as far north as possible. Thus generation after

generation pushes on until late in the season we hear of them as far north as Hudson Bay. As the cool weather approaches these emigrant butterflies gather in great flocks and move back to the South. It is quite impossible for us to understand how the flocks of butterflies are guided in their migrations. There are among their numbers none that are travel-wise, like the leaders of the bird flocks, but still they follow their direction as steadily as the wind will allow. Nor is the monarch satisfied with these journeys to the north and south; it is the strongest flyer of all the butterflies and does not hesitate to try its fortune over the seas, and has been found flying five hundred miles from shore. Either by flight or as stowaways in vessels it has pressed eastward to Europe and westward to the isles of the Pacific. Well is it named the monarch, for it is the most daring and indomitable butterfly that we know, pushing back its geographical boundaries to the edge of the arctic zone, exploring leisurely on confident wing the seas of the Occident and Orient.

The caterpillars when disturbed jerk the whip-lash-like filaments back and forth, this evidently being a method of keeping off the ichneumons. They are smug-looking caterpillars and flaunt

their gay stripes without any attempt to hide, for they seem to know that the birds will not touch them. In the North there is but one brood during the summer, while in the South there are many more. No hibernating specimen has ever been found.

Birds have their nests ; they rear their eager young
And flit on errands all the livelong day ;
Each fieldmouse keeps the homestead where it sprung ;
But thou art nature's freeman—free to stray
Unfettered through the wood,
Seeking thine airy food,
The sweetness spiced on every blossomed spray.

HIGGINSON.

THE QUEEN

Anosia berenice (A-no'si-a ber-e-ni'ce)

PLATE XXXII, FIG. 2, *male* ; PLATE XXVIII, FIG. 3, *female*

The upper surface of the wings is reddish chocolate-brown, with the costal margin of the front wings and the outer margins of both pairs bordered with black. There are two partial rows of white dots near the costal and outer margins of the front wings ; and there is a larger white spot in each of the cells R_5 to Cu. The under surface is similar to the upper, except that the outer border contains two full rows of white spots, and the veins of the hind wings are heavily marked with black edged with gray. The male possesses a black pouch containing androconia next to vein Cu_2 of the hind

wings, as in the preceding species. Expanse of wings two and three-quarters to three and one-half inches.

There is a well-marked variety, *Anosia berenice strigosa* (Plate XXXII, Fig. 2), in which on the upper surface of the hind wings the veins are narrowly edged with grayish white.

CATERPILLAR.—Length, about two inches. The Smith and Abbot colored picture of this species shows it to be whitish tinged with purplish brown with a brown divided cross stripe which encloses a yellowish cross bar on each segment. Low down along each side is a greenish-yellow stripe. The second thoracic and second and eighth abdominal segments each bears a pair of long, brown whiplash filaments.

Food-plant.—Milkweed.

"How beautiful is the occaſional uniformity as well as the infinite variety of Nature! This butterfly, nearly related to the laſt (the monarch), feeds in its caterpillar ſtate on the plants of the ſame genus, though a different ſpecies; and the two caterpillars have a great affinity to each other, though one has but ſix horns, the other but four. The pupæ are extremely ſimilar except in ſize, and are suspended in the ſame manner to a leaf." Thus says Smith and Abbot in the magnificent volume published more than a century ago wherein *berenice* in all her royalty is delineated by hand painting. While the queen affects umber rather than the brilliant orange of the monarch, yet it is a showy insect; the black borders on the

wings are dotted with white and the front wings bear a pretty pattern of white spots. The queen is immune from the attacks of birds both as a caterpillar and a butterfly. Imitation is the sincerest flattery, and the obsequious vice-reine finds the brown wings of the queen quite as admirable in Florida as does the viceroy the bright orange of the monarch farther north.

A glimmering plain in drowsy trance
The dim horizon bounds,
Where all the air is resonant
With sleepy summer sounds—
The life that sings among the flowers,
The lisping of the breeze,
The hot cicada's sultry cry,
The murmurous dream of bees.

The butterfly—a flying flower—
Wheels swift in flashing rings,
And flutters round his quiet kin,
With brave flame-mottled wings.

JOHN HAY.

FAMILY VIII

THE LONG-BEAKS

Family Libytheidæ (Lib-y-the'i-dæ)

The long-beaks can be easily recognized by their excessively long, beak-like palpi, which are from one-fourth to one-half as long as the body and project straight forward (Fig. 38). The outer margin of the fore wings is deeply notched; the males have only four well-developed legs, while the females have six.

Only two species have been found in America north of Mexico, and of these but one occurs in the eastern United States; the other is found in Texas.

The Snout Butterfly

Hypatus bachmani (Hyp'a-tus bach-man'ni)

Fig. 38

The wings are blackish brown above, marked with orange patches and white spots. On the front wings there is an orange patch in cell R + M, and another occupying the middle half of cell Cu and a part of cell Cu_1; between these and the apex of the wing are three white spots; on the hind wings there is an

Fig. 38.—The snout butterfly.

orange patch just beyond cell R + M. Expanse of wings one and three-fourths inches.

CATERPILLAR.—Length about one inch; the head is small; the last two thoracic segments are enlarged and rise in a hump above the head; the last segment of the body slopes down abruptly at the end. The color is dark velvety green with a yellow stripe down the middle of the back and along each side. The enlarged middle segment of the thorax bears two dull black tubercles ringed about with yellow at the base.

Food-plants. — Hackberry, and in the West, where hackberry does not occur, it feeds upon wolfberry.

The snout butterfly has front wings that look as if their tips had been snipped off with curved scissors; it is not likely to be mistaken for any other butterfly even though it is copper-colored with white spots, for its palpi project at least a quarter of an inch straight out in front of the head; this peculiarity has given the species the unpoetical cognomen, "the snout butterfly." The under sides of the hind wings show a beautiful vague pattern of sheeny, olive brown, and ashes of roses. One of the specially interesting things about the species is that the females are hexapods while the males are quadrupeds. Just why the females need six feet when the males need only four is to us a mystery.

The snout butterfly is most erratic in its occur-

rence. There are records of its having appeared in swarms; but usually it is sufficiently rare in any locality to be considered a prize by the butterfly hunter. Its range is through the eastern United States with the exception of northern New England and southern Florida. It haunts river-banks and marshy places in forests and does not disdain shrubby roadsides; it is also very fond of visiting raspberry blossoms. The caterpillar has the habit of rearing the front end of its body and remaining motionless while at rest, like a sphinx caterpillar. It is a most adaptable creature. Mr. Edwards found that if its food-plant dried up it changed to a chrysalid after its third molt, when it was little more than half grown. From such pigmy chrysalids came genuine butterflies, though somewhat small and pale. It is supposed the species winters as a butterfly.

Yet I remember, when the butterfly
Went flickering about me like a flame
That quenched itself in roses suddenly.

JAMES WHITCOMB RILEY.

FAMILY IX

THE METAL-MARKS

Family Riodinidæ (Ri-o-din'i-dæ)

The metal-marks are small butterflies, which bear some resemblance to the gossamer-winged butterflies and were formerly classed with them. They are distinguished from the gossamer-winged butterflies by the presence of a humeral vein in the hind wings, and from them and all other butterflies by the presence of what appears to be a well-preserved costa of the hind wings. In some genera this costal vein is free at the tip and projects (Fig. 39).

Only twelve species are found in America, and nearly all of these are from the far West or Southwest. The two following species occur in the East.

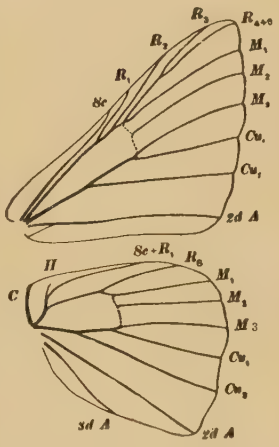


FIG. 39.—Venation of the wings of a *Emesis zela*.

THE SMALL METAL-MARK

Calephelis cænius (Cal-e-phe'lis cæ'ni-us)

PLATE XXXIII, FIG. 1, 2

The upper surface of the wings is rust-colored, and is crossed by four or five more or less sinuous blackish lines on

the basal two-thirds, and on the outer third by two lines of shining scales, that look like cut steel, and an intermediate row of black spots. The under surface is of a brighter rust color and marked as above. Expanse of wings four-fifths of an inch or less.

The early stages are unknown ; the species occurs in the Southern States. It is believed to be several-brooded. We captured specimens in central Florida in April ; and it has been found in Georgia as late as the end of October.

The Large Metal-mark

Calephelis borealis (Cal-e-phe'lis bo-re-a'lis)

The upper surface of the wings is dull brownish yellow, crossed by obscure, transverse stripes ; on the outer half of the wings are two lead-colored lines, with a row of black dots between them. The under surface is of a rather dark and pale orange ; paler and duller next the base, marked with transverse black lines and dots, and transverse series of steel-colored spots. Expanse of wings one to one and one-fourth inches.

The early stages are unknown. The butterfly is very rare in our territory ; it has been taken in New York, New Jersey, West Virginia, Michigan, and Illinois.

FAMILY X

THE GOSSAMER-WINGED BUTTERFLIES

Family Lycænidæ (Ly-cæn'i-dæ)

This family includes butterflies which are of small size and delicate structure. In size they resemble the smaller skippers; but they can be distinguished at a glance from the skippers, as they present an entirely different appearance. The body is slender, the wings delicate and often brightly colored, and the club of the antenna straight. The antennæ are nearly always ringed with white, and a conspicuous rim of white scales encircles the eyes.

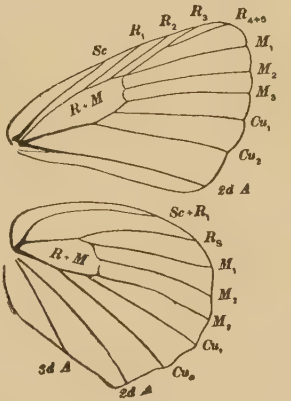


FIG. 40. — Venation of the wings of *Chrysophanus*.

In the venation of the wings they agree with the metal-marks, and differ from all other butterflies described in this book in the following combination of characters: radius of the fore wings is only three- or four-branched, and vein M_1 arises at or near the apex of cell R + M (Fig. 40). In the other butterflies occurring in our fauna in which radius is only three- or four-branched, vein M_1 coalesces with radius for a considerable distance beyond the apex of the discal cell. In

a single species of this family the wanderer (*Feniseca*) vein M_1 coalesces with radius for a considerable distance beyond the apex of cell R + M.

The gossamer-winged butterflies can be distinguished from the metal-marks by the absence of the costal and humeral veins of the hind wings.

In the female the front legs are like the other legs, in the male they are shorter, without tarsal claws, and with the tarsi more or less aborted.

The caterpillars of the Lycænidæ present a very unusual form, being more or less slug-like. The body is short and broad ; the legs and prolegs are short and small, allowing the body to be closely pressed to the object upon which the insect is moving—in fact some of the species glide rather than creep ; and the head is small, and can be retracted more or less within the prothorax. The body is armed with no conspicuous appendages; but some of the species are remarkable for having honey-tubes which can be pushed out from the seventh and eighth abdominal segments, and through which honey-dew is excreted for the use of ants. Certain other species are remarkable in being carnivorous ; one American species feeds exclusively upon plant-lice.

The chrysalids are short, broad, ovate, and without angulations. They are attached by the caudal extremity, and by a loop passing over the body near its middle. The ventral aspect of the body is straight and often closely pressed to the object to which the chrysalis is attached.

The family includes three well-marked groups of genera, which have been distinguished as the hair-streaks, the coppers, and the blues. These groups can be separated by the following table :

A. Radius of the front wings four-branched.

B. Body comparatively stout; colors of the upper surface of the wings orange red with a coppery luster, or brown with a coppery tinge, in each case spotted with black, p. 236. THE COPPERS.

BB. Body slenderer; colors of the upper surface of wings blue or bluish black, p. 244. THE BLUES.

AA. Radius of the fore wings only three-branched, p. 217. THE HAIR-STREAKS.

THE HAIR-STREAKS

The hair-streaks are distinguished from the other gossamer-winged butterflies by the fact that radius of the fore wings is only three-branched. They are usually dark brown, with delicate striped markings on the lower surface of the wings, which suggested to some person of vivid imagination the common name given above; but some species are brilliantly marked with metallic blue or green. The hind wings are also commonly furnished with delicate taillike prolongations. The fore wings of the male often bear a small dull oval spot near the middle of the costal part of the wing, the discal stigma, which is filled with the peculiar scent-scales known as androconia. The males are also distinguished by having a tuft of hairlike scales, the beard, on the front; this is wanting or very thin in the females. About fifty species occur in America north of Mexico; our most common species, which are described below, can be separated by the following table:

A. Hind wings with a long, slender, taillike prolongation at the end of vein Cu_2, and sometimes with a similar one at the end of vein Cu_1.

B. Upper surface of wings conspicuously marked with blue scales.

C. The blue of the upper surface confined chiefly to the hind wings; lower surface of wings with a conspicuous red band on the outer half of wings. (*C. cecrops*), p. 231. THE LEAST PURPLE HAIR-STREAK.

CC. Upper surface of both pairs of wings largely blue; no red band on the outer half of lower surface of wings.

D. Under side of abdomen orange. (*A. halesus*), p. 220. THE GREAT PURPLE HAIR-STREAK.

DD. Under side of abdomen not orange. (*E. m-album*), p. 221. THE WHITE-M HAIR-STREAK.

BB. Upper surface of wings with but few if any blue scales.

C. Lower surface of hind wings bright green marked with brown and white. (*M. damon*), p. 229. THE OLIVE HAIR-STREAK.

CC. Lower surface of hind wings not green.

D. Lower surface of wings pearl gray.

E. Lower surface of wings with a narrow white-edged bar at the end of cell R + M. (*T. acadica*), p. 224. THE ACADIAN HAIR-STREAK.

EE. Without bar at end of cell R + M. (*U. melinus*), p. 223. THE GRAY HAIR-STREAK.

DD. Lower surface of wings slate-brown or blackish.

E. Lower surface of wings crossed just beyond the middle by a bright red band. (*C. cecrops*), p. 231. THE LEAST PURPLE HAIR-STREAK.

EE. Lower surface of wings not crossed by bright red band.

F. Lower surface of wings crossed just outside of the middle by a row of small, dark, blue-edged spots, which form an almost continuous line. (*T. calanus*), p. 226.

THE BANDED HAIR-STREAK.

FF. The spots of the extra mesial row of the lower surface of the wings wide and discontinuous. (*T. liparops*), p. 228.

THE STRIPED HAIR-STREAK.

AA. Hind wings with only a short projection if any at the end of vein Cu_2.

B. Under side of hind wings without a row of orange spots. (*Incisalia.*)

C. With a distinct white or whitish edging near the base of the under side of the hind wings, limiting a darker band that occupies the outer two-thirds of the basal half of the wing. (*I. niphon*), p. 234.

THE BANDED ELFIN.

CC. The darker band on the basal half of the lower surface of the hind wings very indistinctly or not at all limited toward the base.

D. The outer half of the lower surface of the hind wings a pretty uniform rust red, darkest near the margin. (*I. augustus*), p. 231. THE BROWN ELFIN.

DD. The outer half of the lower surface of the hind wings sprinkled, especially near the margin, with pale lilac scales, giving it a hoary bloom. (*I. irus*), p. 233. THE HOARY ELFIN.

BB. Under side of hind wings with a row of orange spots. (*S. titus*), p. 234. THE CORAL HAIR-STREAK.

The Great Purple Hair-streak

Atlides halesus (At'li-des ha-le'sus)

Plate XXXIII, Fig. 3, 4

This is the largest of our Eastern hair-streaks, having an expanse of wings of one and three-fifths to two inches. In the male the greater part of the upper surface of the wings is bright blue; the discal stigma, the outer fourth of the fore wings, the apex and inner margin of the hind wings, and the tails are black. The under side is blackish brown, with a red spot at the base of the fore wings and two or more at the base of the hind wings. The fore wings have a dash of blue along the cubitus, and the hind wings have a group of blue and green spots near the anal angle. The under side of the abdomen is orange. In the female the outer half of the wings is black, and the fore wings lack the dash of blue beneath.

Caterpillar.—Green, slightly downy; on the sides nine oblique, darker green bands; on the back a slight stripe; along the base of the feet a stripe of yellowish green.

Food-plant.—Oak.

"Great" is a relative term in the butterfly world as well as elsewhere. The name great purple hair-streak would seem to imply a vast insect, whereas it is a small butterfly spreading less than two inches, and when it is fully expanded might well be described by that graphic though inelegant word "chunked." The wings are blue-green, changeable in color, and the hind wings

Plate XXXIII.

THE GREAT PURPLE HAIR-STREAK

Atlides halesus (At'li-des ha-le'sus)

PLATE XXXIII, FIG. 3, 4

expanse of wings of one and three-fifths to two inches. In

wings, the apex and inner margin of the hind wings, and the tails are black. The under side is blackish brown, with a

PLATE XXXIII

METAL-MARKS AND HAIR-STREAKS

Fig.

1, 2. The Small Metal-mark, *Calephelis cœnus;* 1, male; 2, female.

3, 4. The Great Purple Hair-streak, *Atlides halesus;* 3, male; 4, female.

5, 6. The White-M Hair-streak, *Eupsyche m-album;* 5, male; 6, female.

7, 8, 9. The Gray Hair-streak, *Uranotes melinus;* 7, male; 8, female; beneath. 9, lower side of wings.

10, 11. The Acadian Hair-streak, *Thecla acadica;* 10, male; 11, lower side of wings.

along the base of the feet a stripe of yellowish green.

Food-plant.—Oak.

gant word "chunked." The wings are blue-

Plate XXXIII.

have an inconsequential little tail just above the eye-spot at the hind angle, and another of still less consequence just beyond it. Underneath the wings are black except for some orange spots near their base; the lower side of the body is bright orange also, making it rather a striking butterfly when the wings are lifted. Abbot associates it with peach blossoms in Florida. It has been found as far north as Nevada and Illinois; it is also found in Arizona and California.

Some finished butterfly,
Some breathing diamond-flake with leaf-gold fans,
That takes the air, no trace of worm it was.

BROWNING.

THE WHITE-M HAIR-STREAK

Eupsyche m-album (Eu-psy'che m-al'bum)

PLATE XXXIII, FIG. 5, 6

The upper surface of the disk of the wings is a rich, glossy, dark blue, with green reflections; a broad outer border and costal margin are black. The hind wings have each two tails, and a bright dark orange spot preceded by white at the anal angle. The under surface is brownish gray. Both wings are crossed by a common, narrow white stripe, which forms a large W or reversed M on the hind wings, whence the specific name of the insect. On the hind wings midway between the M-streak and the outer border there is another series of white bars, and an orange spot in cell

Cu_2. Expanse of wings one and one-third to one and one-half inches.

CATERPILLAR.—Length not quite three-fourths of an inch; head black; body downy, light yellowish green in color with a dull green stripe down the back and seven oblique stripes of the same color along the side.

Food-plants.—Oak and milk-vetch.

This is very much like the preceding species in the blue-green metallic colors of its wings above except that it has more of blue and less of green in the sheen; but as if to mark the species distinct beyond cavil, a white line runs across the lower side of the front and hind wings, making a distinct white M on the latter near the anal angle, and this plainly written initial is punctuated with a crimson period. While the white-m hair-streak occasionally is found as far north as New Jersey, Pennsylvania, and Ohio, it is essentially a species of the South and frequents the live-oak hummocks of that region. It is supposed to be triple-brooded.

I hold you at last in my hand,
  Exquisite child of the air;
Can I ever understand
  How you grew to be so fair?

ALICE FREEMAN PALMER.

The Gray Hair-streak

Uranotes melinus (U-ra-no'tes mel'i-nus)

Plate XXXIII, Fig. 7, 8, 9

The vertex of the head and the tip of the antennæ are orange. The upper surface of the wings is blackish with a slight blue-gray tint; on the middle of the fore wings there is a large, faint, quadrate, cloudy spot of slightly darker scales, extending from near the costal border to cell Cu. Near the outer margin of the hind wings there is an indistinct line of bluish spots. In cell Cu_1 there is a large orange spot surmounting a smaller black one. The under surface is gray, with two blackish-brown lines crossing each wing, the inner line edged externally with white, and internally, at least on the hind wings, with orange scales. The large orange spot and smaller black one in cell Cu_1 of the upper surface are repeated. Expanse of wings one and one-fourth inches.

Caterpillar.—Less than half an inch long and slug-shaped, with very small head. The body is naked, and is reddish brown without markings.

Food-plants.—The fruit and seeds of hop, hawthorn, hound's-tongue, and St.-John's-wort.

This little creature just saves itself from Quaker costume by an orange spot or two and by a frivolous white-tipped tail that looks like a curlicue. The female is particularly gay, having two white-tipped tails to her wings which are above yellowish brown in color, and below delicate yellowish gray. The gray hair-streak is a

frisky little creature living up to its orange spots in action rather than to its decorous body color; it dances about shrubbery, and is much given to taking long swigs of nectar from the flowers of the bush-clover. It is a long-lived butterfly and flies from June to September here in the North, where it is double-brooded, and probably winters as a chrysalid. It occurs throughout the United States. The caterpillar lives in the pods or seeds of its food-plant, and is therefore quite destructive; it is quite as extensible as if it were made of india-rubber.

The Acadian Hair-streak

Thecla acadica (Thec'la a-cad'i-ca)

Plate XXXIII, Fig. 10, 11

The upper surface of the wings is of a uniform blackish slate brown; costal edge of fore wings, especially near the base, tawny. In cell Cu_1 of the hind wings, a submarginal, orange, lunate spot, which is indistinctly continued to the inner border of the wing. The under surface is pearl gray; on each wing there is a dark bar edged with white at the end of cell R + M; beyond this a bent row of roundish black spots encircled with white; and beyond this a submarginal row of black lunules edged within with white, and followed without by orange spots. The orange spots of the front wings are inconspicuous; but on the hind wings they increase in size toward the anal angle, except that the one in cell Cu

is largely covered by a blue patch. The most available characters for distinguishing this species are the pale pearl-gray color of the lower side, and the small size of the spots of the extra mesial row; these of both pairs of wings are round, very black, and completely encircled with white; usually each spot occupies but little more than half the width of a cell. Expanse of wings one and one-fifth inches.

CATERPILLAR.—Length about one-half inch; slug-shaped; the brown head is very small; the body is almost oval in outline and grass green in color. Two yellowish stripes along the side include a row of oblique short stripes of the same color.

Food-plant.—Willow.

This bronze-brown midget loves to flit about willow-fringed streams. Though it is dull-colored at first glance, a second look at the lower surface of the wings reveals to us a shining, bronze gray specked with black and with a patch of heavenly blue set in the row of orange spots that decorate the hind border of the hind wing, making a most harmonious color scheme. This butterfly must have been expelled from Acadia with Evangeline, as there is no record of its having been found as far north as Acadia since it was discovered and named. It is quite peculiar in its distribution, inhabiting a narrow belt that extends from New England west to Montana. On the Pacific coast it is found from Los Angeles to Vancouver. Its little, soft, supple caterpillar

lives upon several species of willow; it trims down the leaf, methodically beginning at the outer edge and eating toward the center. The winter is passed in the egg state.

> But she—God love her!—feared to brush
> The dust from off its wings.
>
> WORDSWORTH.

THE BANDED HAIR-STREAK

Thecla calanus (Thec'la cal'a-nus)

PLATE XXXIV, FIG. 1, 2, 3

The upper surface of the wings is dark brown or blackish brown. There is sometimes an orange spot in cell Cu_1 of the hind wings, and a more or less distinct bluish white line extending from vein Cu_1 to the anal angle of the same wings. The under surface is blackish slate brown, nearly as dark as the upper surface; there is a dark bar edged with bluish white at the end of cell R + M of both wings, and just outside of the middle a row of small, dark, blue-edged spots, which form an almost continuous line; and a submarginal series of black crescents, edged within with white. Expanse of wings one and one-fifth inches.

The larva feeds on oak and hickory. Excepting the southern portions of the Gulf States, the species is found throughout our territory east of the Rocky Mountains and in the southern part of Canada. It is our most common species of Thecla.

CATERPILLAR.—Slug-shaped; length one-half inch; bright grass green in color marked with lighter and darker lines

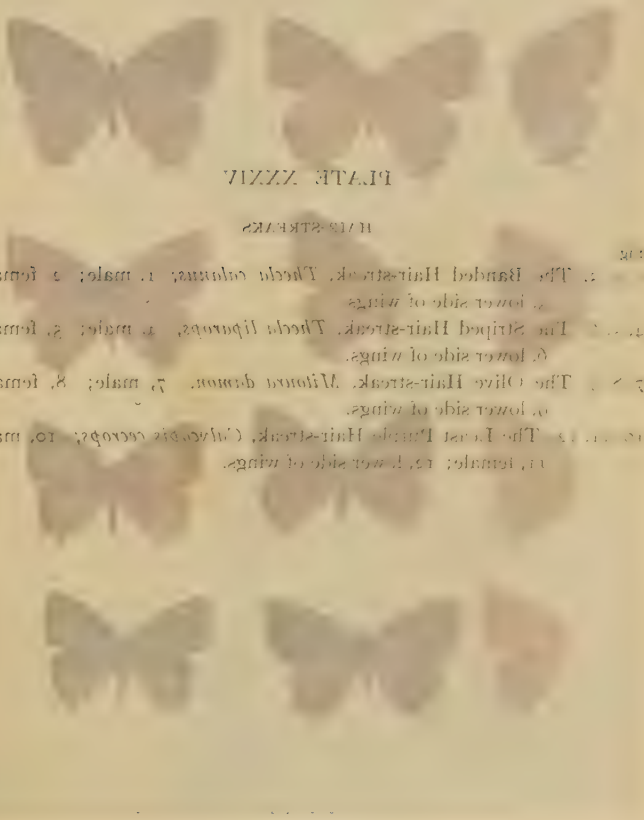


Plate XXXIV.

is passed in the egg state.

But she—God love her!—feared to brush
The dust from off its wings.

WORDSWORTH.

THE BANDED HAIR-STREAK

PLATE XXXIV

Thecla calanus (Thec'la cal'a-nus)

HAIR-STREAKS

PLATE XXXIV, FIG. 1, 2, 3

Fig.

1, 2, 3. The Banded Hair-streak, *Thecla calanus;* 1, male; 2, female; 3, lower side of wings.

4, 5, 6. The Striped Hair-streak, *Thecla liparops;* 4, male; 5, female; 6, lower side of wings.

7, 8, 9. The Olive Hair-streak, *Mitoura damon;* 7, male; 8, female; 9, lower side of wings.

10, 11, 12. The Least Purple Hair-streak, *Calycopis cecrops;* 10, male; 11, female; 12, lower side of wings.

crescents, edged within with white. Expanse of wings one and one-fifth inches.

southern portions of the Gulf States, the species is found throughout our territory east of the Rocky Mountains and in the southern part of Canada. It is our most common species of Thecla.

CATERPILLAR.—Slug-shaped; length one-half inch; bright

Plate XXXIV.

running lengthwise of the body. Sometimes it is purple brown instead of grass green in color.

Food-plants.—Oak, hickory, and butternut.

This is our commonest Thecla, and may be found almost anywhere in the United States east of the Rocky Mountains except in southern Florida. It is frisky and erratic in its flight; it abjures civilization, and frequents various forest openings, being especially fond of scrub-oak clearings. From the West comes the report that in the spring it shows a liking for the odoriferous skunk-cabbage, a plant which seems to have more friends among insects than among folks. Though dull in color, the banded hair-streak has long, graceful white-tipped tails on the hind wings, and has a most elegant pattern of brown and white fringe just at the inner base of the longest tail. On the grayish lower surface of the wings are black spots margined with white; a blue patch flanked with orange on the inner angle of the hind wing makes us realize that the Theclas are artistic even though modest in their garb. The male of this Thecla shows especially well the oval patch of pale brown scales on the upper surface of each front wing which is composed of scent scales, and which form his greatest

attraction for his perfume-loving lady Thecla. The slug-like caterpillars eat holes in the leaves. The species is single-brooded, and winters as a newly hatched caterpillar.

Beneath the summer sky
From flower to flower let him fly;
'Tis all that he wishes to do.

WORDSWORTH.

THE STRIPED HAIR-STREAK

Thecla liparops (Thec'la lip'a-rops)

PLATE XXXIV, FIG. 4, 5, 6

The upper surface of the wings is uniform blackish brown; there is sometimes an obscure orange spot in cell Cu_1 of the hind wings. The lower surface is dark brown, with a delicate rufo-purplish tinge; the outer margin is edged with a narrow white line; and the surface of each wing is crossed by from three to five irregular white stripes, the number varying in the different parts of the wing. The spot at the end of the discal cells and the extra mesial band are very wide, and only slightly darker than the remainder of the wing; and the spots of the extra mesial band are discontinuous. Expanse of wings one and one-fifth inches.

CATERPILLAR.—Slug-shaped; length one-half inch; body grass green with faint oblique stripes of yellow along the sides.

Food-plants.—Shadbush; blueberry; oak, and willow.

This dark, brown Thecla is never common, although it occurs almost everywhere in the

United States east of the Rockies and north of the Gulf States. The tails of the hind wings are not very long, and sometimes the outer one is just indicated by a point. The many white hair-streaks that cross the lower side of the wings give the butterfly its name. It is always found near thickets, and it has a lively, nervous flight. The caterpillar may attack the pulp of the fruit as well as the leaves of its food-plant. The first butterflies appear in July and disappear after a short time. It is single-brooded, and winters as an egg.

The Olive Hair-streak

Mitoura damon (Mi-tou'ra da'mon)

Plate XXXIV, Fig. 7, 8, 9

The upper surface of the wings is dark brown, with the disk more or less deeply suffused with brassy yellow in the male or tawny in the female; the tails of the hind wings black tipped with white. The lower surface is deep green, with the portion of the fore wings covered by the hind pair pale slate brown; the fore wings are traversed by a nearly straight submarginal white stripe bordered interiorly with brown; there is a similar but tortuous stripe on the outer half of the hind wings; near the base of the hind wings there are two white spots bordered without with brown, and near the outer margin of these wings there is a series of black spots, margined without and more or less covered with white. Expanse of wings one inch.

CATERPILLAR.—Slug-shaped; a little more than half an inch long; its body is dark green, and along the sides are two stripes made up of more or less oblique white dashes.

Food-plants.—Red cedar and smilax.

The olive hair-streak has wings which are rich brown-black above. The under sides of the hind wings are bright olive green, and the front edges of the front wings are the same color, which shades off gradually into tan at the middle of the wing. The white streak across the lower side of the wing is thick and very striking, and it is bordered with rust red inside. The tail on the hind wings is just a little slender spike. This Thecla belongs to the South, where it flits about the tops of the forests of red cedar. The caterpillar is a robust-looking little fellow, but it is so exactly cedar-leaf color that it is well protected, though it feeds on the very tips of the twigs. The caterpillar of this species also feed upon smilax, and in some of the books this species is called *Thecla smilacis*. It winters as a chrysalis.

The butterfly's assumption grown,
In chrysoprase apartments hung,
This afternoon put on.

EMILY DICKINSON.

The Least Purple Hair-streak

Calycopis cecrops (Cal-y-co'pis ce'crops)

Plate XXXIV, Fig. 10, 11, 12

The upper surface of the wings is a rich blackish brown, in some specimens entirely so, in others it is tinged with blue on the fore wings, and heavily marked with blue on the hind wings. The lower surface is pale slate brown, with a conspicuous red band on the outer half of the wings. This band is edged without by a narrow black line, which in turn is edged by a broader white one. Expanse of wings about one inch.

Caterpillar.—Unknown.

This species varies greatly in color, the blue that suggested the common name being absent in many specimens. The special beauty of this minute species lies in the bright red band that marks the under side of the hind wings.

The Brown Elfin

Incisalia augustus (In-ci-sa'li-a au-gus'tus)

Plate XXXV, Fig. 1, 2, 3

Three of our Eastern hair-streaks represent the genus *Incisalia*. These are dark brownish butterflies, in which the fringe of the outer margin of the hind wings is slightly prolonged at the end of each vein, giving the wings a scalloped outline; but there are no prominent taillike prolongations of the wings as in all the hair-streaks described above. In the outer third of the inner margin of the hind wings there is a deep rounded excision, producing a conspicuous lobe at the anal angle.

The discal stigma of the fore wings is present in the males, but is unusually inconspicuous. The under surface is nearly as dark as the upper, especially on the basal half, which is separated from the outer half by a wavy line; there are no orange-colored spots on this surface. These are among the earliest of our butterflies, appearing in the Northern States in April and May; they usually fly but little more than a month. The three species can be separated by the characters given in the table above. They are similar in size, expanding about one inch.

CATERPILLAR.—About one-half an inch long, and slug-shaped; head very small; color of the body carmine red.

Food-plant.—Unknown.

It is strange that the food-plant of a carmine red caterpillar should escape the attention of our keen-eyed entomological observers of the East. The one caterpillar described seems to have been a specimen from Nevada, and it is quite possible that the larvæ of this species in the East may have a different color. The brown elfin likes a rocky hillside covered with blueberry, and is likely to alight upon the rock or dead twigs where its wings, brown above and below, protect it from observation. It occurs in New England and southward to Virginia. It is single-brooded, and hibernates as a chrysalis. This species, like the other elfins, has no taillike processes on the hind wings, but has a graceful in-

Plate XXXV

... of the fore wings is present in the males, ... inconspicuous. The under surface is nearly ... upper, especially on the basal half, which is ... from the outer half by a wavy line; there are no ... spots on this surface. These are among the ... butterflies, appearing in the Northern States in ... May; they ... by but little more than a month. ... by the characters given in ... ular in size, expanding about

PLATE XXXV

... ...

Plate XXXV.

ward turning scallop at the tip of the anal angle of the hind wing.

The Hoary Elfin

Incisalia irus (In-ci-sa'li-a i'rus)

Plate XXXV, Fig. 4, 5, 6

See the preceding description.

Caterpillar.—Slug-shaped ; one-half an inch long ; head very small ; body downy, greenish above and reddish brown on the sides.

Food-plant.—Wild plum.

The gray which gives this elfin its name is only seen on the outer half of the lower side of the hind wings, and often it is more lilac than gray ; except for this it is as brown as the other elfins. It is the laziest of all the hair-streaks and loves to loaf around shrubs in open places, and even haunts the roadsides. The caterpillar is a little rascal that burrows in and devours the fruit of the wild plum.

The species is distributed from the southern part of New England to Georgia and westward to Missouri.

The Banded Elfin

Incisalia niphon (In-ci-sa'li-a ni'phon)

Plate XXXV, Fig. 7, 8, 9

See description under the brown elfin above.

Caterpillar. — Slug-shaped; length a little more than half an inch. It has a little brown head; the downy body is green, with two lengthwise whitish stripes along each side.

Food-plant.—Pine.

The banded elfin is dull dark brown above, but beneath, especially on the hind wings, it looks like an elfin checker-board made in varying shades of brown with white dividing lines here and there. This butterfly is an active little creature and loves the open spaces in the pine woods. Its home is in the northeastern United States, and it has not been taken west of New York. It is single-brooded, and the caterpillars require almost the entire season to mature.

The Coral Hair-streak

Strymon titus (Stry'mon ti'tus)

Plate XXXV, Fig. 10, 11, 12

The upper surface of the wings is dark brown, with or without an outer marginal row of orange spots or an indistinct orange band. The discal stigma is present in the males, and the outline of the hind wings differs in the two sexes. The under surface is a soft slaty brown, sometimes tinged with vio-

laceous; the outer half of the wings is crossed by a series of black spots encircled or bordered without with white; between these spots and the outer margin there is a series of small black lunules, which are bordered within with white and followed without by a corresponding series of reddish or orange spots. Both the black lunules and the orange or red spots may be very indistinct or wanting on the fore wings; but they are prominent on the hind wings. Expanse of wings one and one-fourth inches.

CATERPILLAR.--Three-fourths of an inch long, and slug-shaped; its head is little and black; its body is downy and dull yellowish green; there is a "rosy patch" on the back at either end.

Food-plants.—Wild cherry and plum.

In the coral hair-streak the threadlike tails are wanting, and instead the anal angle of the hind wing is prolonged and acute. The species gets its pretty name from the row of coral beadlike spots that margin the hind wing on the lower side. The gentle Abbot describes this species as a "little brown butterfly," which, though not distinctive, is deeply satisfactory when one knows the species. It loves to visit the flowers of goldenrod and thistle, and others that blossom in the open fields, where it may bask in the hot sunshine while it is refreshing itself with nectar. It is widely distributed in the United States. It occurs in great numbers during the last of July and the

first of August. It winters in the egg state and is single-brooded.

THE COPPERS

The coppers are easily distinguished from other gossamer-winged butterflies by their orange-red and brown colors, each with a coppery tinge, and conspicuous black markings. They are the stoutest of the Lycænidæ. About twenty species are known to occur in this country, but only four are found in the East. These can be separated by the following table :

A. Vein M_1 of the fore wings arising from vein R_5 at a considerable distance beyond the apex of cell R + M. (*F. tarquinius*), p. 237. THE WANDERER.

AA. Vein M_1 of the fore wings arising at the apex of cell R + M.

B. Hind wings with a broad orange-red band on the outer margin extending from the anal angle nearly to the apex.

C. Of small size, expanding about one inch. (*C. hypophlæas*), p. 241. THE AMERICAN COPPER.

CC. Of medium size, expanding about one and one-half inches. (*C. thoe*), p. 239. THE BRONZE COPPER.

BB. Hind wings with a sinuous submarginal orange line beginning at the anal angle and fading out near the middle of the outer margin. (*E. epixanthe*), p. 240. THE PURPLE DISK.

Plate XXXVI.

is single-brooded.

THE COPPERS

winged butterflies by their orange-red and brown colors, each with a coppery tinge, and conspicuous black markings. They are the stoutest of the Lycænidæ. About twenty species are

the East. These can be separated by the following table :

PLATE XXXVI

THE COPPERS

Fig.

1, 2. The Wanderer, *Feniseca tarquinius;* 1, upper side; 2, lower side.
3, 4. The Bronze Copper, *Chrysophanus thoe;* 3, male; 4, female.
5, 6. The Purple Disk, *Epidemia epixanthe;* 5, male; 6, female.
7, 8. The American Copper, *Heodes hypophleas;* 7, male; 8, female.

B. Hind wings with a broad orange-red band on the

apex.

C. Of small size, expanding about one inch. (*C. hypophlœas*), p. 241. THE AMERICAN COPPER.

inches. (*C. thoe*), p. 239. THE BRONZE COPPER.

dle of the outer margin. (*E. epixanthe*), p. 240.

THE PURPLE DISK.

Plate XXXVI.

The Wanderer

Feniseca tarquinius (Fe-nis'e-ca tar-quin'i-us)

Plate XXXVI, Fig. 1, 2

This butterfly can be readily distinguished from all other Lycænids in our fauna by the fact that vein M_1 of the fore wings coalesces with radius for a considerable distance beyond the apex of cell R + M. The upper surface of the wings is dark brown, with a large, irregular orange-yellow patch on the disk of the fore wing, and one of the same color next the anal angle of the hind wing.

Caterpillar.—Length about half an inch; body rather pointed at the ends and wide in the middle. Color brown marked with brownish stripes.

Food.—Woolly plant-lice, especially those on the alder.

If there is a place in this world more replete with contentment than a path by an alder-fringed brook we have failed to find it; and when we wander along such a path we always look out for our fellow wanderer, the little copper butterfly with dark blotches on its wings. We usually find it either dashing about in quick, nervous flight above the alders, or resting on a leaf with wings expanded taking a sun bath, a special butterfly luxury. The wanderer is a good and helpful friend of the alders, and it plays about one selfsame spot all its little life. There are a great many kinds of blight in this world; there are blighted hopes and blighted hearts, but an alder blight consists

of plant-lice that are covered with a white woolly secretion. These little creatures thrust their beaks into an alder stem and suck the juice at their leisure; they live in compact colonies so that the alder stem looks as if it were wound with wool. The little butterfly mother selects a stem so infested and lays her eggs upon it; from these eggs hatch wee caterpillars that start at once on their career of slaughter. When among the aphids the caterpillar weaves about itself a silken covering to protect it from being trod upon by the aphids and to provide a secure place for molting; to this silk the wool of the destroyed aphids clings and completely hides from view the little butcher. When not among the aphids and passing from one colony to another it spins no such tube to cover itself. If the alder stem is jarred the caterpillar will detach itself from the mass of aphids and drop to the ground; or let itself down for a little distance by a thread of silk, a habit not common among butterfly caterpillars. Perhaps it does this to save itself from its inveterate foes, the ants, which attack fiercely any depredator they find working havoc with their flock of milch cows, the aphids. It seems to be to escape the ants that this caterpillar hurries through its life stages, molting only three times. The chrysalis looks

like the head of a minute monkey. There are three broods of the wanderer in the North, and it winters as a chrysalis. It is found from Maine to northern Florida and westward to Kansas.

"Whose butterfly," I said, "are you,
And what sweet thing do you pursue?"

STODDARD.

THE BRONZE COPPER

Chrysophanus thoe (Chrys-o-pha'nus tho'e)

PLATE XXXVI, FIG. 3, 4

In the male the wings are coppery brown above, spotted with black, and with a broad orange-red band on the outer margin of the hind wings; below, the front wings are very pale orange, and the hind wings gray, both spotted with black, the hind wings with an orange band on outer maring. The female differs in having the front wings orange-red above with prominent black spots, and in being of a brighter orange below than in the male. Expanse of wings one and one-half inches or more.

CATERPILLAR.—Slug-shaped, nearly an inch long. Color of body bright yellowish green, with a dark green stripe down the back.

Food-plants.—Curled dock, some species of knotweed, prickly ash, etc.

The female of this species looks like a giant American copper; the male has reddish-brown wings except for a marginal border of orange on

the hind pair. The bronze copper is a rare insect although it occurs from the Connecticut Valley westward to Nebraska. Perhaps because it is a giant of its kind it is more unwieldy in flight than are its smaller relatives. It is fond of goldenrod, and finds the flowers of the Canada thistle an attractive lounging-place. It frequents damp places in meadows and may be found here and there in salt marshes along the coast. It is double-brooded, and winters as an egg.

The butterflies yellow,
  As caught in an eddy
Of air's silent ocean,
  Sink, wander and steady
O'er the goat's-beard and asters,
  Like souls of dead flowers,
With aimless emotion
Still lingering unready
  To leave their old bowers.

LOWELL.

THE PURPLE DISK

Epidemia epixanthe (Ep-i-de'mi-a ep-i-xan'the)

PLATE XXXVI, FIG. 5, 6

The wings above are brown in the male, with a strong reflection, in the female they are grayish brown. Both wings are more or less spotted with black, and on the hind wings there is a sinuous submarginal orange line, beginning at the anal angle and fading out near the middle of the outer margin.

In the female there is a line of black spots on the outer half of the fore wings that are wanting in the male. Below, the wings are gray spotted with black. Expanse of wings one inch or less.

CATERPILLAR.—Not described and food-plant unknown.

It is very little we know of this Lilliputian butterfly except that it requires a keen eye helped by a robust imagination to see any purple whatever on its wings. The female's wings are yellow bronze; but if the wings of the male are held in the right light there is a sheen upon them that suggests the red purple of the clover blossom. On the under side the wings of the female are lemon yellow, and those of the male gray with yellowish pearly sheen. Surely size has nothing to do with spirit, for this merest mite of a butterfly is a born fighter, and Mr. Saunders says soon wears out its wings in tilts and combats at butterfly tournaments. It frequents cranberry bogs and swampy meadows and is very local in its habits. It is found in Canada and New England and westward to Kansas.

THE AMERICAN COPPER

Heodes hypophlœas (He-o'des hyp-o-phlæ'as)

PLATE XXXVI, FIG. 7, 8

We have in the East two very common coppers, this species and the female of the bronze copper, that closely resemble

each other in general appearance; the two species present, however, a marked difference in size. The front wings are orange-red above spotted with black, and with a blackish brown outer border; the hind wings are coppery brown, with a broad orange-red band on the outer margin; this band is indented on the outer edge with four black spots and there is a black bar on the medial cross-veins. The lower surface of the front wings is orange-red spotted with black, and with the outer margin gray; the black spots are margined with white rings. The lower surface of the hind wings is gray, marked with smaller black spots than those of the front wings, and with a wavy submarginal line of bright orange. Expanse of wings one to one and one-fifth inches.

CATERPILLAR.—Slug-shaped, length nearly a half an inch. The body is downy, and dull rosy red in color with yellowish tints on the sides; or it may be green with a reddish stripe down the back.

Food-plant.—Sorrel.

We have always been sorry for those unfortunate people who have never had a pair of these beautiful midgets as tenants of their lawn. For years we have had at least one pair on ours to fly at us when we came out and by making desperate dashes at our heads try to drive us off of what they consider their preserves. They evidently base their claims on the presence of sorrel, which once we would have deemed a disgrace to any lawn. But lawns, like children, were evidently meant to educate their possessors; and while we

began with strenuous effort to have only clover and grass on ours, indefatigable Nature planted all things there as soon as our backs were turned. After a time we grew in grace and came to love the dandelions and dock, orchard grass, and white daisies; and more than all do we appreciate the rosy bloom which sorrel lends to our possessions, especially, because of it, a pair of American coppers live with us. In early summer they are always there, these little fractions of red sunshine, dancing about or wrestling in the air with each other and chasing off intruders. Once we saw them attack a tiger swallow-tail and drive him off the premises; and once we saw them chase a huge bulldog with the same confidence and *aplomb*. It is always a joy to us to watch one alight on a flower, it has such an alert air while it orients itself by turning around and around like a dog before he lies down. It is especially fond of the blossoms of white clover, and unless engaged in a fight it usually flies rather low. When a pair begins housekeeping they select some site and never stray far from it during the entire season. The caterpillar is shaped like a spindle cut in halves lengthwise; it is sorrel color, and so is protected. The chrysalis is hidden beneath sticks and stones. The species occurs in

Canada, the Northern States, and in the Alleghany Mountains southward to Georgia. It is double-brooded in the North and triple-brooded in the South, and winters as a chrysalis.

From cocoon forth a butterfly
As lady from her door
Emerged—a summer afternoon—
Repairing everywhere,
Without design, that I could trace,
Except to stray abroad
On miscellaneous enterprise
The clovers understood.

EMILY DICKINSON.

THE BLUES

The Blues may be distinguished from the other gossamer-winged butterflies by the slender form of the body and the blue color of the upper surface of the wings. This is a rather difficult group to study owing to the fact that in several cases a single species exists under two or more distinct forms, and also that the two sexes of the same species may differ greatly. It often happens that two individuals of the same sex but of different species resemble each other more closely in the coloring of the upper surface than do the two sexes of either of the species. In each of our Eastern species the upper surface of the wings of the female is much darker than that of the male.

Fifty North American species have been described; but most of these occur only in the far West. Four species occur in the East; these can be separated as follows:

A. Hind wings without tails.

B. Eyes hairy.

C. Lower surface of the wings slate brown. (*N. lygdamus*), p. 245. THE SILVERY BLUE.

CC. Lower surface of the wings pale ash-gray. (*C. ladon*), p. 249. THE SPRING AZURE.

BB. Eyes naked. (*R. scudderi*), p. 246. SCUDDER'S BLUE.

AA. Hind wings with a slender taillike prolongation. (*E. comyntas*), p. 254. THE TAILED BLUE.

THE SILVERY BLUE

Nomiades lygdamus (No-mi'a-des lyg'da-mus)

PLATE XXXVII, FIG. 1, 2, 3

Wings above pale, glistening, frosty blue, narrowly bordered in the male and widely in the female with blackish brown. Wings beneath uniform, slate brown, with or without a black spot in cell R + M of each wing, with a black line or bar bordered with white on the medial cross-veins, and with a row of conspicuous black spots edged with white crossing the middle of the outer half of the wing. On the hind wings there is an additional spot near the extremity of the basal third of cell R_1. Expanse of wings one to one and a half inches.

The adults occur in the spring in Ohio, Michigan, and Wisconsin, and in the Atlantic States from the upper waters of the Susquehanna to Georgia.

CATERPILLAR.—Early stages unknown.

There are several things in this world that it were better to know nothing about, such as a perfect passage of music or a bit of exquisite color. Both were meant to appeal to the soul through the senses, and knowledge about them is superfluous and a distracting factor. Therefore we feel a certain satisfaction in not being able to give any facts about the life history of the silvery blue. All that we know is that it bears on its wings a blue found nowhere else in the world except in the pearly spectrum of the sea-shell, and that it gladdens the springtime in Ohio and Michigan, and Wisconsin, and the Atlantic States as far south as Georgia. But whence it comes, or whither it goes, or what sort of an herb is privileged to assist in bringing such a divine bit of color in the world we know not.

Scudder's Blue

Rusticus scudderi (Rus'ti-cus scud'der-i)

Plate XXXVII, Fig. 4, 5, 6

The eyes are naked. In both sexes the costal edge of the fore wings is white. In the males the wings are of a uniform purplish violet above, narrowly margined with blackish brown; in the female the violet is confined to a small portion of the disk of the wing, the larger part of the wing being dark brown. In this sex there is a submarginal series of roundish dark brown spots in the cells of the hind wings;

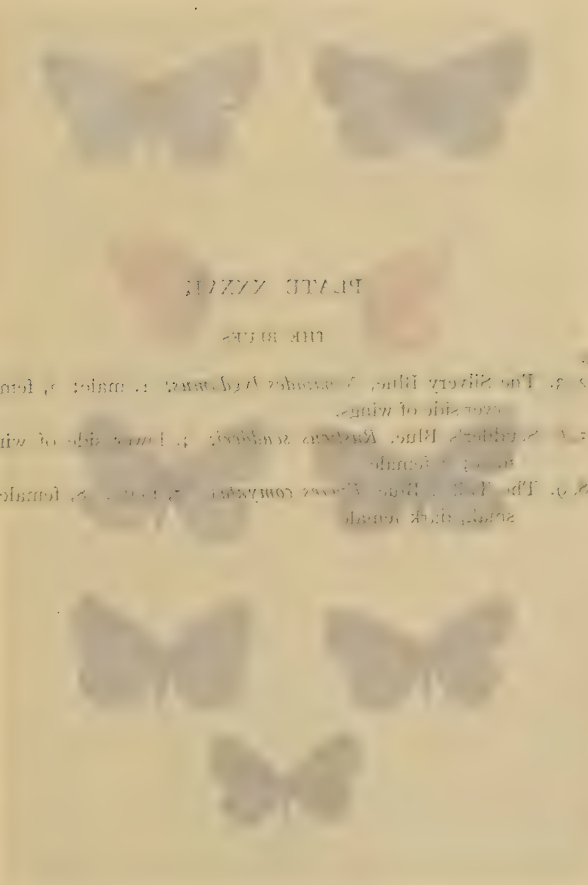


Plate XXXVII.

[illegible] several things in this world that [illegible] to know nothing about, such as [illegible] of music or a bit of exquis[illegible] [illegible] Both were meant to appeal to the so[illegible] through the senses, and knowledge about the[illegible] [illegible]duous and a distracting factor. There[illegible] we feel a certain satisfaction in not bein[illegible] [illegible] the silvery blue. All that we know is that [illegible]

PLATE XXXVII

THE BLUES

Fig.

1, 2, 3. The Silvery Blue, *Nomiades lygdamus;* 1, male; 2, female; 3, lower side of wings.

4, 5, 6. Scudder's Blue, *Rusticus scudderi;* 4, lower side of wings; 5, male; 6, female.

7, 8, 9. The Tailed Blue, *Everes comyntas;* 7, male; 8, female; 9, a small, dark female.

Scudder's Blue

Rusticus scudderi (Rus'ti-cus scud'der-i)

Plate XXXVII, Fig. 4, 5, 6

The eyes are naked. In both sexes the costal edge of the fore wings is white. In the [illegible] the wings are of a uniform purplish violet above, narrowly margined with blackish brown; in the female the violet is confined to a small portion of the disk of the wing, the larger part of the wing being dark brown. In this sex there is a submarginal series of roundish dark brown spots in the cells of the hind wings

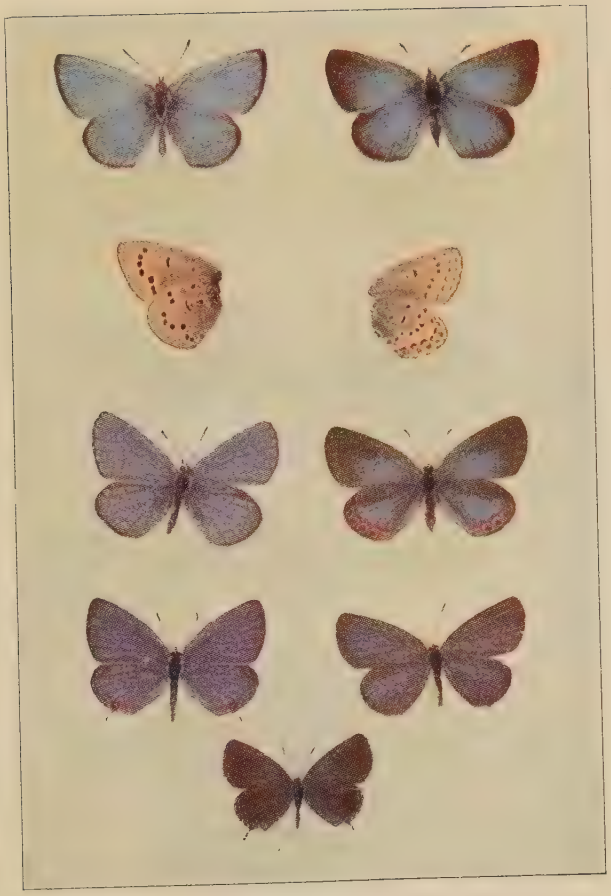


Plate XXXVII.

these spots are more or less surmounted and embraced by orange lunules. Beneath in both sexes the wings are pale hoary slate gray. On the fore wings the medial cross-veins bear a black spot encircled with white; beyond this there is a series of six similar spots. Between this series and the outer margin there is a series of pale orange or whitish spots bordered within and without with black. The hind wings are marked in a similar manner; there are eight spots in the series next beyond the medial cross-veins, and on the base of the wing there is a transverse series of four or more less distinct black spots. The orange spots are more distinctly marked than on the fore wings, and the outer black border of these spots is more or less covered with pale metallic greenish scales. Expanse of wings one inch.

This is a Canadian butterfly; but it occurs in certain parts of New York and probably in New England. The species is two-brooded.

CATERPILLAR.—Length, about one-half inch. Color pea-green with a yellowish tinge on the sides of the abdomen. Body is sparsely covered with short hairs and the body walls are rather transparent.

Food-plant.—Wild lupine.

Surely it must be one of Mr. Scudder's compensations for a lifetime of infinitely patient and loving research in the habits of butterflies that this beautiful little creature bears his name. Far better to have a name preserved on glinting wings than on tablets of stone, for stone crumbles in the course of time; but every summer

when the wild roses bloom through all the future centuries this butterfly will come and tell to a glad world that the life of a great and noble man was lived in closest touch with Nature.

There is a purple tinge to the sapphire iridescent wings of Scudder's blue; and the female has a row of orange spots with black centers bordering her hind wings and just a hint of a similar border on the front wings. The species is Canadian, though it occurs in New England and New York. It flies close to the ground, and loves to collect in large numbers about damp places looking from a distance like a still pool mirroring the sky.

The caterpillar is a flexible, extensible little creature and loves to poke its tiny head between the upper and lower surface of a leaf and suck the soft juices. No need of vivisection in order to study the internal anatomy of this caterpillar, for all its inner workings may be seen through the transparent body walls. It secretes honeydew and is in high favor with the ants.

"See a little blue butterfly fluttering about on the dry brown leaves in a warm place by the swamp side, making a pleasant contrast." THOREAU.

The Spring Azure

Cyaniris ladon (Cy-a-ni'ris la'don)

Plate XXXVIII, Fig. 1–13

In this species the hind wings are without tails, the eyes are hairy, and the lower surface of the wings is pale ash-gray. This combination of characters will distinguish it from all other blues occurring in the eastern United States. But the species is not confined to this region, as it occurs in nearly all parts of the United States and in a large part of Canada.

This butterfly exhibits a very complicated polymorphism, both seasonal and sexual; nine forms are now recognized and named; of these five occur in the East. The five eastern forms can be separated by the following table based on the publications of Mr. Edwards.

A. The spots on the outer margin of the lower surface of the wings blurred so as to form a continuous band (Plate XXXVIII, Fig. 2, 5).

B. The spots in the middle of the lower surface of the hind wings also blurred. (*C. ladon lucia.*)
The Northern Spring Form.

BB. The spots in the middle of the hind wing distinct. (*C. ladon marginata.*) The Margined Spring Form.

AA. The spots on the lower surface of wings not blurred (Plate XXXVIII, Fig. 8, 13).

B. Markings on lower side of wings comparatively heavy. Early spring butterflies. (*C. ladon violacea.*)
The Typical Spring Form.

BB. Markings on lower side of wings lighter.

C. Larger butterflies, expanding one and three-eighths inches. (*C. ladon ladon.*)

THE LATE SPRING FORM.

CC. Smaller butterflies, expanding one and three-sixteenths inches. (*C. ladon neglecta.*)

THE SUMMER FORM.

(1) The northern spring form, *Cyaniris ladon lucia.*—This is more heavily marked on the lower surface than either of the other forms; the spots on the outer margin of the lower surface of the wings are blurred so as to form a continuous band, and usually the markings in the middle of the hind wings are also blurred and run together to a considerable extent. It occurs in Canada and in the northern portions of the eastern United States. Where it occurs it is the first butterfly of the season, excepting those species (the angle-wings) that hibernate in the adult state.

(2) The margined spring form, *Cyaniris ladon marginata.*—There is a heavily marked form occurring in the spring in which the markings in the middle of the under surface of the hind wings are quite distinct, but those of the margin of the wing are blurred, making a continuous band. This form does not extend as far north as *lucia*, the northern limit of its range being about lat. 45° on the Atlantic coast.

(3) The typical spring form, *Cyaniris ladon violacea.*—In this form the markings of the lower side of the wings are quite heavy, but they are not blurred as in the other two spring forms. In the southern part of its range, say south of lat. 38°, *violacea* is dimorphic, the males appearing under two forms, one blue above, the normal *violacea*, and the other dark brown, *C. ladon violacea-nigra.*

PLATE XXXVIII.

Fig. 1. The Southern Orange Tip (Pontia Daplidice) : male, 2, lower side of wing.

3, 4. The Mountain Orange Tip (Pontia Callidice) : male, 3, upper side of wing.

5, 6. The Green-veined White (Pieris Napi) : male, 5, upper side of wing.

7, 8. The Large White or Cabbage Butterfly (Pieris Brassicæ) : male, 7, upper side of wing.

9, 10. The Lesser Green-veined White (Pieris Rapæ) : male, 9, female.

11, 12. The Small White or Wood White (Pieris Rapæ, var. Napææ) : male, 11, female.

PLATE XXXVIII

THE SPRING AZURE

(Cyaniris ladon)

Figs. are also blurred and run r

1, 2. The Northern Spring Form, *Cyaniris ladon lucia;* 1, male; 2, lower side of wings.

3, 4, 5. The Margined Spring Form, *Cyaniris ladon marginata;* 3, male; 4, female; 5, lower side of wings.

6, 7, 8. The Typical Spring Form, *Cyaniris ladon violacea;* 6, male; 7, female; 8, lower side of wings.

9, 10. The Late Spring Form, *Cyaniris ladon ladon;* 9, male; 10, female.

11, 12, 13. The Summer Form, *Cyaniris ladon neglecta;* 11, male; 12, female; 13, lower side of wings.

Plate XXXVIII.

(4) The late spring form, *Cyaniris ladon ladon*.—In the southern part of the range of the species, *i. e.* south of lat. 40° on the Atlantic coast but as far north as Montana in the West, there appears, from over-wintering chrysalids, but considerably later than the forms described above, a fourth spring form. This is the largest form of the species, expanding one and four-tenths inches; and the spots on the under side are much smaller than in either of the preceding forms. This form has been known as *pseudargiolus;* but *ladon* is the older name.

(5) The summer form, *Cyaniris ladon neglecta*.—In the more northern portions of the range of the species, *i. e.* north of Montreal, this butterfly is single-brooded; but south of that region a second generation of butterflies is produced from eggs laid by the spring forms. This generation appears in June, and a third generation may appear in the fall. Both of these generations are of the type known as *neglecta*. This form resembles the late spring form in markings, but is smaller, not expanding more than one and one-tenth inches.

Mr. Scudder does not regard *neglecta* as distinct from *C. ladon ladon*, or *pseudargiolus* as it has been more commonly termed; according to this view *neglecta* is one of the spring forms as well as *the* summer form. And we have had difficulty in separating the two by the characteristic of size as given in the table above.

The following table, based on the publications of Mr. W. H. Edwards, indicates the distribution of the forms described above:

GEOGRAPHICAL DISTRIBUTION IN THE EAST OF THE FORMS OF THE SPRING AZURE

BOREAL AMERICA (Labrador to Alaska).

Only one brood, dimorphic.

C. ladon lucia.

C. ladon violacea.

LAT. 45°–41° N. (Montreal to Long Island).

Two broods.

I. Winter Forms or first generation.

C. ladon lucia.

C. ladon marginata.

C. ladon violacea.

II. Summer Form or second generation.

C. ladon neglecta.

LAT. 41°–38° OR 39° N. (Long Island to West Virginia).

I. Winter Forms or first generation.

C. ladon violacea.

C. ladon ladon.

II. Summer Form or second generation.

C. ladon neglecta.

SOUTH OF 38° OR 39° N. (West Virginia to Gulf of Mexico).

I. Winter Forms or first generation.

C. ladon violacea (male and female).

C. ladon violacea-nigra (male).

C. ladon ladon.

II. Summer Form or second generation.

C. ladon neglecta.

Remarkable organs exist in the seventh and eighth abdominal segments of the larvæ of certain Lycænids. These

have been studied more carefully in this than in other species. There is a slit on the middle line of the dorsal part of the seventh abdominal segment. From this opening the caterpillar can protrude a membranous vesicle, from the summit of which exudes a small drop of clear, sweet fluid, a kind of honey-dew. Ants feed upon this; and there doubtless exists between the Lycænid larvæ possessing this organ and various species of ants relations similar to those existing between aphids and ants; as Mr. Edwards observed an ant successfully defend a larva of the spring azure from an attack of an ichneumon-fly. Upon the eighth abdominal segment there is a pair of openings from each of which can be protruded a membranous tube, furnished at the tip with numerous, long, slender tentacles. These in turn are armed with fine filamentous spurs disposed in whorls. The function of these organs has not been determined; they may be scent-organs for the attraction of ants.

CATERPILLAR.—Length, two-fifths of an inch; slug-shaped, dark brown head. Body white with a dusky line down the back and a greenish tinge along the sides.

Food-plants.—Dogwood, Actinomeris, black snakeroot, sumac, Spiræa, and others.

In the early spring when we are weary of winter this butterfly appears in our path like a fleck of the welcome blue sky above. It flits about on uncertain wing or loafs about damp places or hovers about the forest mantle. It is one of the butterflies that we have repeatedly seen winging lazily in and out the topmost

branches of a chestnut oak in front of our windows. What though the spring azure appears in Protean forms! The more incarnations of a butterfly so beautiful the better.

The spring azure's caterpillar loves to bore into the very heart of the flower, and is of undoubted assistance to Nature in her great work of blossom pruning.

> Or is thy luster drawn from heavenly hues,
> A sumptuous drifting fragment of the sky?
>
> T. W. Higginson.

The Tailed Blue

Everes comyntas (E-ve'res co-myn'tas)

Plate XXXVII, Fig. 7, 8, 9

The possession of taillike prolongations of the hind wings distinguishes this butterfly from the other blues occurring in our Eastern fauna. The males are dark purplish violet above bordered with brown, the females dark brown, sometimes flecked with bluish scales. In both sexes there are several black spots and one or two orange crescents on the outer margin of the hind wings. Beneath, the wings are whitish gray, and marked somewhat like the lighter forms of the preceding species, except in the presence of orange crescents near the anal angle of the hind wings. Expanse of wings about one inch.

Caterpillar.—Length one-third of an inch; slug-shaped. Head very small and black. Body downy, dark green in

color with a dusky stripe down the back, and faint oblique markings along the sides of similar color.

Food-plants.—Flowers of clover and other legumes.

This species has much purple in its changeable wings, but it is hidden under brown in the wings of the female. The tail, which gives the name to the species, is the merest black thread, but its tip is white and it is much more impressive when viewed through a lens. The tailed blue is in possession of the greater part of America from the Atlantic to the Pacific, from the Isthmus to the British dominions. It loves overgrown roads and paths, the more neglected the better. It has a rapid, nervous flight and alights frequently. So rapid are its maneuvers in the air that the eye can not follow it. The caterpillar likes best the flowers of its food-plant, and especially enjoys boring into the calyx, although it has been observed feeding upon the terminal leaves of clover. The species is triple-brooded.

Bubble, bubble flows the stream,
Like a song heard in a dream.
A white-faced hornet hurtles by,
Lags a turquoise butterfly—
One intent on prey and treasure,
One afloat on tides of pleasure!

MAURICE THOMPSON.

PART III

THE SKIPPERS

Superfamily Hesperioidea (Hes-per-i-oi'de-a)

THE skippers are commonly classed with the butterflies; for this reason they are discussed here, although the writer believes that they constitute a superfamily distinct from the butterflies.

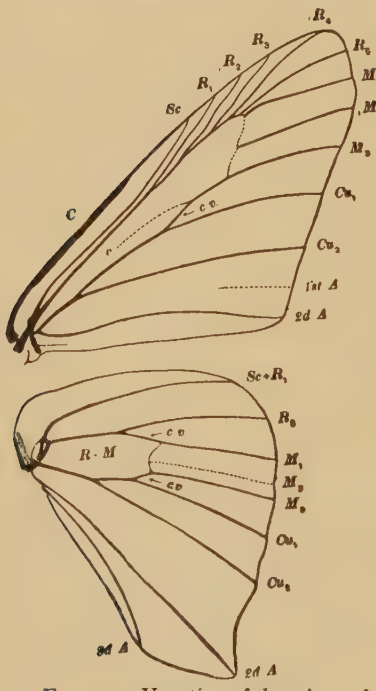


FIG. 41.—Venation of the wings of *Epargyreus tityrus*.

The skippers are so called on account of their peculiar mode of flight. They fly in the daytime and dart suddenly from place to place. When at rest most species hold the wings erect in a vertical position like butterflies; in some the fore wings are thus held while the hind wings are extended horizontally; and a few extend both pairs of wings horizontally. The antennæ are threadlike, and enlarged toward the tip; but in most cases the extreme tip is pointed and

recurved, forming a hook. The abdomen is usually stout, resembling that of a moth rather than that of a butterfly. The skippers are most easily distinguished by the peculiar venation of the fore wings, radius being five-branched, and all the branches arising from cell R + M (Fig. 41). In some butterflies all the branches of radius appear to arise from the cell R + M; but this is because two of the branches coalesce to the margin of the wing. In such butterflies radius appears to be only four-branched.

This superfamily includes two families—the Giant Skippers, *Megathymidæ*, and the Common Skippers, *Hesperiidæ*. These can be distinguished as follows :

A. Head of moderate size ; club of antenna large, neither drawn out at the tip nor recurved. Large skippers, with wing expanse of two inches or more, p. 258.

THE GIANT SKIPPERS.

AA. Head very large ; club of antenna usually drawn out at the tip, and with a distinct recurved apical crook. In a few forms the crook of the antennæ is wanting ; such forms can be distinguished from the Megathymidæ by their smaller size, the wing expanse being less than one and one-fourth inches, p. 260. THE COMMON SKIPPERS.

FAMILY I

THE GIANT SKIPPERS

Family Megathymidæ (Meg-a-thym'i-dæ)

This family includes a small number of large skippers, which are found in the South and far West. In the adult insect the head is of moderate size, the width, including the eyes, being much less than that of the metathorax. The club of the antennæ is large, and although the tip is turned slightly to one side, it is neither drawn out to a point nor recurved. The body is very robust, even more so than in the common skippers. These insects fly in the daytime and with a rapid, darting flight. When at rest they fold their wings in a vertical position.

This family is represented in the United States by a single genus including five species. The two following are the best-known species.

THE COFAQUI SKIPPER

Megathymus cofaqui (Meg-a-thy'mus cof-a-qui')

The female of this species is represented by Fig. 42. The male differs in the smaller size of the spots on the fore wing, in lacking the band of spots on the hind wing, and in having the upper surface of the hind wing nearly covered with long fine black hairs, which stand nearly erect. This species has been found in Florida and Colorado.

THE YUCCA-BORER

Megathymus yuccæ (Meg-a-thy'mus yuc'cæ)

The female of this species differs from that of the preceding in having much darker wings, all of the spots being smaller, and in having only one or two white spots on the lower surface of the hind wings. The male lacks the erect hairs on

FIG. 42.—The cofaqui skipper, *Megathymus cofaqui.*

the hind wings. The larva bores in the stem and root of the Yucca or Spanish Bayonet. It differs greatly in appearance from the larvæ of the Hesperiidæ, having a small head. This species is widely distributed through the southern part of our country.

FAMILY II

THE COMMON SKIPPERS

Family Hesperiidæ (Hes-pe-ri'i-dæ)

The family Hesperiidæ includes all skippers found in the United States except those already described as the giant skippers. Fig. 41 represents the venation of a member of this family.

The larvæ of the common skippers presents a very characteristic appearance, having large heads and strongly constricted necks (Fig. 43). They usually live concealed in a folded leaf or in a nest made of several leaves fastened together. The pupæ are rounded, not angular, resembling those of moths more than those of butterflies. The pupa state is passed in a slight cocoon, which is generally composed of leaves fastened together with silk and thinly lined with the same substance.

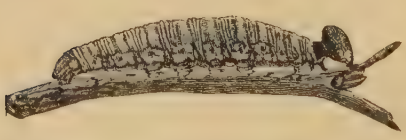


Fig. 43.—Larva of the silver-spotted skipper.

The family Hesperiidæ includes three subfamilies; one of these is represented in this country by a single species found in Arizona and Mexico. The other two subfamilies can be separated by the following table:

A. Vein M_2 of the fore wings arising much nearer to vein M_3 than to vein M_1, the base of the vein usually curving noticeably toward vein M (Fig. 44); antennæ usually ending with a finely pointed terminal crook, occasionally without crook and ending bluntly; males usually with a brand on the fore wings, never with a costal fold. (*Pamphilinæ*), p. 261.

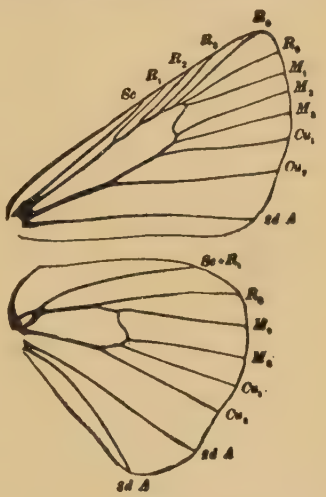


FIG. 44.—Venation of the wings of *Erynnis sassacus*.

SKIPPERS WITH A BRAND AND THEIR ALLIES

AA. Vein M_2 of the fore wings retaining its primitive position midway between veins M_1 and M_3, or nearer to vein M_1 than to M_3 at base (Fig. 41); antennæ usually with a long club which is bent at a considerable distance from the tip; males almost invariably with a costal fold, never with a brand. (*Hesperiinæ*), p. 288.

SKIPPERS WITH A COSTAL FOLD AND THEIR ALLIES.

SKIPPERS WITH A BRAND AND THEIR ALLIES

Subfamily Pamphilinæ (Pam-phi-li'næ)

This subfamily includes the greater number of our smaller skippers; some of the species, however, surpass in size many of the Hesperiinæ. To the Pamphilinæ belong all of our common tawny skippers, as well as some black or dark-

brown species. The antennæ usually have a stout club, with a short recurved tip ; sometimes this tip is wanting. Vein M_2 of the fore wings arises much nearer to vein M_3 than to vein M_1, the base of the vein usually curving noticeably toward vein M_3 (Fig. 44). In the majority of our species the males can be recognized at a glance by a conspicuous patch crossing the disk of the fore wings, which usually appears to the naked eye like a scorched, oblique streak, and which, on this account, is termed the brand (Fig. 45). The brand is a complicated organ, composed of tubular scales, the *androconia*, that are the outlets of scent-glands, and of other scales of various shapes ; in some species the brand is wanting.

FIG. 45.—A male skipper with a brand.

This subfamily is an exceedingly difficult one to study, as the differences between allied species in many cases is very slight. Another confusing feature is the fact that in very many cases either sex resembles the same sex of other species much more closely than it does the opposite sex of the same species ; and, too, in several species there are two distinct forms of females which differ in appearance from each other more than either does from the females of certain other species. In the latter case the species is represented by three distinct forms, one male and two female.

More than one hundred species have been described from America north of Mexico ; the more common species that occur in the East are described below and can be separated by the following table :

A. Fringe of wings conspicuously marked with alternating colors. (*Amblyscirtes.*)

B. The pale markings on the under surface of the hind wings obscure, the whole wing flecked with lilac scales on a purplish ground. (*A. vialis*), p. 270.

THE ROADSIDE SKIPPER.

BB. Markings on under surface of hind wings distinct, the whole wing flecked with pale yellowish-green scales on a dark brown ground. (*A. samoset*), p. 271.

THE PEPPER-AND-SALT SKIPPER.

AA. Fringe of wings not marked with alternating colors.

B. Club of antennæ without a recurved apical hook, resembling the antennæ of butterflies.

C. Under surface of hind wings with silvery white spots. (*P. palæmon*), p. 272. THE ARCTIC SKIPPER.

CC. Under surface of hind wings without silvery white spots.

D. Upper surface of hind wings yellow, with the costal and outer margins blackish brown. (*A. numitor*), p. 272. THE LEAST SKIPPER.

DD. Upper surface of hind wings of a uniform brown. (*O. powesheik*), p. 273. THE POWESHEIK SKIPPER.

BB. Club of antennæ with a recurved apical hook.

C. Exceptionally large species, the wings expanding about two inches. With a well-marked vestigial vein in cell R + M of the fore wing. (*C. ethlius*), p. 285.

THE BRAZILIAN SKIPPER.

CC. Species of moderate size, the expanse of the wings rarely exceeding one and one-half inches. No vestigial vein in cell R + M of the fore wing. (*The Erynnis Group.*)

D. The upper surface of the wings black or dark blackish brown, this color extending quite uniformly over the entire wings excepting for some well-defined whitish or tawny spots of small or moderate size ; in some species the wings are without spots.

E. Wings without whitish or tawny spots both above and below.

F. Fore wings with a brand. (*E. vestris*), p. 283. THE DUN SKIPPER (male).

FF. Fore wings without a brand. (*E. fusca*), p. 284. THE SWARTHY SKIPPER.

EE. Wings with whitish or tawny spots, either above or below or both.

F. Lower surface of hind wings yellow with dark brown spots, the yellow extending to the outer margin of the wing. (*T. brettus*), p. 279. THE WHIRLABOUT (female).

FF. Lower surface of hind wings with a large, bright spot covering the central portion of the wing but not extending to the outer margin. (*P. massasoit*), p. 273. THE MULBERRY WING.

FFF. Lower surface of hind wings mottled with reddish brown, the outer third sprinkled with bluish scales. (*A. zabulon*), p. 274. THE ZABULON SKIPPER (female).

FFFF. Lower surface of hind wings dark blackish brown.

G. Lower surface of hind wings without spots. (*E. vestris*), p. 283. THE DUN SKIPPER.

GG. Lower surface of the hind wings with a conspicuous V-shaped band, the apex of the V pointing toward the outer margin of the wing. (*E. metea*), p. 277.

THE COBWEB SKIPPER (female).

GGG. Lower surface of hind wings with a curved row of small, indistinct spots on the outer half.

H. Fore wings with a brand (males).

I. The brand consisting of two separate black patches. (*T. otho egeremet*), p. 280.

THE OTHO SKIPPER (Black Form).

II. The brand continuous. (*E. verna*), p. 283. THE LITTLE GLASS-WING.

HH. Fore wings without a brand (females).

I. Terminal crook of the antennæ longer than the width of the club. (*E. vestris metacomet*), p. 283.

THE DUN SKIPPER.

II. Crook of the antennæ shorter than the width of the club.

J. The transverse row of spots beyond the middle of the fore wing abbreviated, lacking the spots in cells R_3 and Cu. (*T. otho egeremet*), p. 279.

THE OTHO SKIPPER.

JJ. The transverse row of spots not abbreviated.

K. Lower surface of hind wings tinged with a yellowish snuff-color; the white spot in cell Cu_1 of the fore wings smaller than in the following species. (See Plate XLII, Fig. 8.) (*L. manataaqua*), p. 286.

THE CROSS-LINE SKIPPER.

KK. Lower surface of hind wings tinged with ruddy purplish; spot in cell Cu_1 of the fore wings larger. (Plate XLI, Fig. 14). (*E. verna*), p. 283.

THE LITTLE GLASS-WING.

DD. The upper surface of the wings largely tawny excepting a more or less distinct outer-marginal band and sometimes a blackish basal area.

E. Ground color of lower side of hind wings greenish yellow spotted with distinct dark brown spots. (*T. brettus*), p. 279. THE WHIRLABOUT (male).

EE. Lower side of hind wings not marked with distinct spots that are of a *darker* color than the ground color.

F. Lower surface of hind wings with a row of spots beyond the middle of the wing, the spots *lighter* than the ground color.

G. The spot between veins M_1 and M_3 of the lower side of the hind wing (vein M_2 is wanting) extending to the base of the wing through cell R + M. (Plate XLII, Fig. 12.) (*P. viator*), p. 287. THE BROAD-WINGED SKIPPER.

GG. The spot between veins M_1 and M_3, not extending into cell R + M.

H. The spots on the outer half of the lower side of the hind wings forming a continuous V-shaped band not interrupted by darker scales on the veins. (*E. metea*), p. 277. THE COBWEB SKIPPER (male).

HH. The spots on the outer half of the lower side of the hind wings more or less distinctly separated by darker scales on the veins.

I. Lower side of fore wings with a large distinct light-colored patch just beyond the middle in cell Cu.

J. The spots on the outer half of the lower side of the hind wings very distinct, being either silvery white or a bright yellow.

K. Ground color of lower side of the hind wings green. (*E. comma*), p. 276. THE CANADIAN SKIPPER.

KK. Ground color of lower side of hind wings brown. (*A. leonardus*), p. 277. LEONARD'S SKIPPER.

JJ. The spots on the outer half of the lower side of the hind wings tawny, sometimes inconspicuous.

K. Upper surface of hind wings with a row of distinct spots beyond the middle.

L. Spots in cells M_3 and Cu_1 of fore wings translucent. (*H. campestris*), p. 278.

THE SACHEM (female).

LL. Spots in cells M_3 and Cu_1 tawny. (*T. mystic*), p. 281.

THE LONG DASH.

KK. Upper surface of hind wings with a discal patch of yellow. (*E. sassacus*), p. 276.

THE INDIAN SKIPPER.

II. Lower side of fore wings without a light-colored patch in cell Cu or with a diffused indistinct one.

J. Fore wings with a brand.

K. Fore wings with a broad yellow band separating the brand from the dark outer border of the wing and extending back to the anal vein. (*L. pontiac*), p. 285.

THE BLACK DASH (male).

KK. The dark outer border of the wing extending to the brand except where it is interrupted by some small yellow spots.

L. The brand consisting of two velvety black patches separated by a patch of large scales of a lighter color. (*T. otho*), p. 279.

THE OTHO SKIPPER (male).

LL. The brand not divided by a patch of large scales. (*L. manataaqua*), p. 286.

THE CROSS-LINE SKIPPER (male).

JJ. Fore wings without a brand.

K. With a distinct band of yellow spots on the upper surface of hind wings. (*L. pontiac*), p. 285.

THE BLACK DASH (female).

KK. The spots on the upper surface of hind wings absent or only faintly indicated. (*T. otho*), p. 279.

THE OTHO SKIPPER (female).

FF. Lower surface of the hind wings either without spots or with a large central patch lighter than the ground color.

G. Lower surface of hind wings with a well-marked central yellow patch.

H. Upper surface of fore wings chiefly yellow except the outer marginal band.

I. Fore wings with a brand. (*H. campestris*), p. 278. THE SACHEM (male).

II. Fore wings without a brand.

J. The central yellow patch of the lower side of the hind wings covering the larger part of the wing. (*A. zabulon*), p. 274.

THE ZABULON SKIPPER (male).

JJ. The central yellow patch of the lower side of the hind wings covering less than half of the wing. (*A. hobomok*), p. 275. THE MORMON.

HH. Upper surface of fore wings chiefly brown. (*P. peckius*), p. 282. THE YELLOW SPOT.

GG. Lower surface of hind wings without a central yellow patch or at most with a paler central area.

H. Lower surface of hind wings blackish brown.

I. Lower surface of hind wings with a paler central area. (*A. hobomok pocahontas*), p. 275. THE MORMON (black female).

II. Lower surface of hind wings uniformly dark. (*T. cernes*), p. 281. THE TAWNY-EDGED SKIPPER.

HH. Lower surface of hind wings yellow.

I. Fore wings with a brand. (*H. campestris*), p. 278. THE SACHEM (male).

II. Fore wings without a brand. (*P. vitellius*), p. 288. THE VITELLIUS SKIPPER.

THE ROADSIDE SKIPPER

Amblyscirtes vialis (Am-bly-scir'tes vi-a'lis)

PLATE XXXIX, FIG. 1, 2

The upper surface of the wings is dark blackish brown; the fore wings have three small white spots in cells R_3, R_4, and

Plate XXXIX

PLATE XXXIX

SKIPPERS WITH A BRAND AND THEIR ALLIES

Fig.

1, 2. The Roadside Skipper, *Amblyscirtes vialis;* 1, upper side; 2, lower side of wings.

3, 4. The Pepper-and-Salt Skipper, *Amblyscirtes samoset;* 3, lower side of wings; 4, upper side.

5, 6. The Arctic Skipper, *Pamphila palæmon;* 5, upper side; 6, lower side of wings.

7. The Powesheik Skipper, *Oarisma powescheik.*

8. The Least Skipper, *Ancyloxipha numitor.*

9, 10. The Mulberry-wing, *Poanes massasoit,* male; 9, lower side of wings; 10, upper side.

11, 12, 13. The Zabulon Skipper, *Atrytone zabulon;* 11, male; 12, female; 13, lower side of wings of female.

14. The Mormon, *Atrytone hobomok.*

15, 16. The Mormon, the Dark Female Form, *Atrytone hobomok pocahontas;* 15, upper side; 16, lower side of wings.

17, 18, 19. The Canadian Skipper, *Erynnis comma;* 17, male; 18, female; 19, lower side of wings.

Plate XXXIX.

R_5, and are with or without an inconspicuous pale spot in cell Cu_1; sometimes there are also fainter spots in cells M_3 and M_2; the fore wings of the male lack the brand; hind wings without markings. On the lower surface the markings of the upper surface are repeated, and the wings are sprinkled with lilac scales. Fringes of the wings gray spotted with dark brown at the ends of the veins. Expanse of wings one inch.

Distributed from Maine to Florida and westward to Montana. Larva feeds on grasses.

The Pepper-and-Salt Skipper

Amblyscirtes samoset (Am-bly-scir'tes sam'o-set)

Plate XXXIX, Fig. 3, 4

The upper surface of the wings is a rich dark brown; the fore wings have three small white spots in cells R_3, R_4, and R_5, as in the preceding species, and also distinct spots in cells Cu_1, M_3, and M_2; the fore wings of the male lack the brand; on the hind wings there is sometimes an indistinct band on the outer half of the wing. On the lower surface the wings are lighter, being overlaid with greenish scales, the markings of the upper surface are repeated and are more distinct; the band on the outer half of the hind wings is distinct, and also several spots on the basal half of the wing. The fringes of the wings are white marked with dark brown at the ends of the veins. Expanse of wings one and one-tenth inches.

Occurs in the Northern and Middle States and west to Iowa.

The Arctic Skipper

Pamphila palæmon (Pam'phi-la pa-læ'mon)

Plate XXXIX, Fig. 5, 6

This well-marked species differs in appearance from all other skippers in our fauna; it can be easily recognized by the figure. The club of the antennæ lacks a recurved apical hook; the upper side of the wings is dark brown conspicuously marked with yellow spots, as shown in the figure; the fore wings of the male lack the brand; the spots on the lower side of the hind wings are silvery white. Expanse of wings one and one-eighth inches.

This is a Canadian species which is distributed from Hudson Bay south to the mountains of New England. The larva feeds on grasses.

The Least Skipper

Ancyloxipha numitor (An-cy-lox'i-pha nu'mi-tor)

Plate XXXIX, Fig. 8

This is the smallest of our common species. As in the preceding species and the one immediately following, the club of the antennæ lacks a recurved apical hook. The wings are tawny, broadly margined with dark brown; in some specimens the fore wings are almost entirely brown; the fore wings of the male lack the brand. The larger individuals expand about one inch.

Occurs throughout the eastern United States. The larva feeds on grasses in damp places.

The Powesheik Skipper

Oarisma powesheik (O-a-ris'ma pow'e-sheik)

Plate XXXIX, Fig. 7

In this species, as in the two preceding, the club of the antennæ lacks the terminal hook. The upper surface of both fore and hind wings is dark brown; the costal margin of the fore wings to near the apex is dull yellow; the fore wings of the male lack the brand. Expanse of wings one and one-fifth inches.

This is a Western species, occurring in Illinois, Iowa, Nebraska, Dakota, and Montana.

Powesheik was the name of a friendly chief of Territorial times in the West.

The Mulberry-Wing

Poanes massasoit (Po'a-nes mas-sa-so'it)

Plate XXXIX, Fig. 9, 10

The upper surface of the wings is blackish brown; the fringe of the wings is slightly paler, and yellowish at the anal angle. In the female there are three small, yellow spots near the apex of the fore wing, and two larger ones in cells M_3 and Cu_1; on the hind wing there is a row of spots just beyond the middle of the wing. In the male the upper surface of the wings may be without spots, the brand is lacking. On the lower surface of the hind wings there is a large central bright straw-yellow spot.

The Suffused Form, *Poanes massasoit suffusa*.—In this form the yellow markings of the lower side of the hind wings are

almost obliterated by a suffusion of dark brown, while the lower side of the fore wings is of a uniform dark brown, the light-colored margin found in the normal form being entirely wanting. The yellow spots on the upper surface of the wings of the female are also wanting.

Occurs in the Eastern and Middle States, Nebraska, Colorado, and Texas.

The Zabulon Skipper

Atrytone zabulon (At-ry-to'ne zab'u-lon)

Plate XXXIX, Fig. 11, 12, 13

The two sexes of this skipper differ greatly in appearance, the male being chiefly yellow, the female black. In the *male* the upper surface of the wings is pale dull yellow, dusky at base, and with the margins, except the costal margin of the fore wings, bordered with blackish brown. There is a black bar at the end of cell R + M of the fore wings, but no brand. The lower surface of the wings is also largely yellow; the yellow central patch of the hind wings covers the greater part of the wing.

In the *female* the wings are dark blackish brown; the fore wings are crossed by a row of light spots, as shown in Fig. 12 of Plate XXXIX. On the lower surface the spots on the fore wings are larger than above; the hind wings are mottled with reddish brown, and have the outer third sprinkled with bluish scales.

Occurs throughout the eastern United States, except in the extreme South. Larva feeds on grass.

The Mormon

Atrytone hobomok (At-ry-to'ne ho-bo'mok)

Plate XXXIX, Fig. 14, 15, 16

The common name of this species refers to the fact that the female is dimorphic; there being a yellow form, which clearly resembles the male, and a dark brown form, which differs so markedly in appearance that it was first described as a distinct species.

The male and the yellow female closely resemble the male of the preceding species, of which until recently they have been considered a variety. As in that species, the upper surface of the wings is pale yellow, dusky at base, and with the margins, except the costal margin of the fore wings, bordered with blackish brown; there is a black bar at the end of cell R+M of the fore wings, but no brand in the male. The dark markings of the wings are more pronounced than in the zabulon skipper, and on the lower surface of the hind wings the central yellow patch is smaller, covering less than half of the wing. Expanse of wings about one and one-fifth inches.

The Dark Female Form, *Atrytone hobomok pocahontas.*—Both surfaces of wings chiefly dark brown; the fore wings have a row of light spots beyond the middle, and the hind wings have a more or less distinct central patch of lighter color.

Occurs from Canada to Mississippi Valley. Larva feeds on grasses.

The Canadian Skipper

Erynnis comma (E-ryn'nis com'ma)

Plate XXXIX, Fig. 17, 18, 19

In the *male* the upper surface of the wings are dull yellow with the outer margins brownish; there is a distinct brand. In the *female* the yellow color is more obscured by brownish scales, but there is a transverse row of spots beyond the middle of both fore and hind wings. On the lower surface of the fore wings the markings of the upper surface are repeated, and the hind wings are greenish with white spots; the green is more pronounced than in any other species occurring in the East. Expanse of wings one inch to one and one-fourth inches.

Occurs in Canada from the Atlantic to the Pacific, and in the mountains of the western United States.

The Indian Skipper

Erynnis sassacus (E-ryn'nis sas'sa-cus)

Plate XL, Fig. 1, 2, 3

The upper surface of the wings is largely yellow in both sexes, with the margins, except the costal margin of the fore wings, brown, and with a brand in the male. The lower surface of the wings is pale, dull, greenish buff with the lighter markings of the upper surface more or less distinctly repeated.

The upper surface of this skipper resembles quite closely the male and the yellow female of the mormon, but the central, light-colored patch of the lower side of the hind

Plate XL.

PLATE XL

SKIPPERS WITH A BRAND AND THEIR ALLIES

Fig.

1, 2, 3. The Indian Skipper, *Erynnis sassacus;* 1, male; 2, female; 3, lower side of wings.

4, 5, 6. The Cobweb Skipper, *Erynnis metea;* 4, male; 5, female; 6, lower side of wings.

7, 8, 9. Leonard's Skipper, *Anthomaster leonardus;* 7, male; 8, female; 9, lower side of wings.

10, 11, 12. The Sachem, *Hylephila campestris;* 10, male; 11, female; 12, lower side of wings.

13, 14, 15. The Whirlabout, *Thymelicus brettus;* 13, male; 14, female; 15, lower side of wings.

16, 17, 18. The Long Dash, *Thymelicus mystic;* 16, male; 17, female; 18, lower side of wings.

Plate XL.

wings is much less distinct in this species than in the yellow forms of the mormon.

Occurs in the Atlantic States and westward to Colorado. Larva feeds on grasses. Sassacus was the name of an Indian warrior.

The Cobweb Skipper

Erynnis metea (E-ryn'nis me'te-a)

Plate XL, Fig. 4, 5, 6

The upper surface of the wings is dark brown with whitish spots beyond the middle and tinged with yellow in the male; the male has a brand. This species is most easily recognized by the white markings of the lower side of the hind wings, the row of spots beyond the middle of the wing forming a continuous V-shaped band not interrupted by darker scales on the veins. Expanse of wings one and one-fifth to one and one-third inches.

The common name probably refers to the white markings of the lower side of the hind wings.

The skipper has been taken in New England, New York, and Wisconsin. The larva feeds on grasses.

Leonard's Skipper

Anthomaster leonardus (An-tho-mas'ter le-o-nar'dus)

Plate XL, Fig. 7, 8, 9

The upper surface of the wings is largely dark brown spotted and shaded with tawny, the yellow color covering a

larger portion of the wings in the male than in the female; the male has a brand. The lower surface of the wings is reddish brown with very distinct silvery white or bright yellow markings. On the fore wings there is a blackish cloud surrounding the white spots in cells Cu_1 and Cu and extending to the base of the wing. Expanse of wings one and three-tenths to one and four-tenths inches.

This insect was named after Rev. L. W. Leonard, who gave a specimen to Harris, from which the species was first described. It occurs on the Atlantic coast from New England to Florida and westward to Kansas. The larva feeds on grasses.

The Sachem

Hylephila campestris (Hy-leph'i-la cam-pes'tris)

Plate XL, Fig. 10, 11, 12

In the *male* the upper surface of the fore wings is dark yellow with a tawny tinge, dusky at base, the outer border dark brown and with a discal brand; the central portion of the hind wings is yellow, but traversed by brownish veins and surrounded by a dark brown margin. The light markings of the upper surface are repeated on the lower surface.

In the *female* the upper surface of both pairs of wings is dark brown with a row of lighter spots beyond the middle; the spots in cells M_3 and Cu_1 of the fore wings are translucent.

Expanse of wings one and one-fifth to one and one-half inches.

This insect was long known under the specific named *huron*, which probably suggested the common name sachem. The species is distributed over the eastern two thirds of the United States. In the South the larva feeds on Bermuda grass, and makes a retreat by fastening together leaves.

The Whirlabout

Thymelicus brettus (Thy-mel'i-cus bret'tus)

Plate XL, Fig. 13, 14, 15

The two sexes of this species differ greatly in appearance when seen from above. In the male the upper surface of the wings is largely yellow, with a brand, and with a dark brown outer border; in the female the wings are almost entirely dark brown, with a transverse row of spots beyond the middle of the fore wings. The most distinctive feature of this species is the color of the lower surface of the hind wings, which is similar in the two sexes, and is a greenish yellow spotted with distinct dark brown spots. Expanse of wings one and one-tenth to one and one-half inches.

This skipper has been found along the seaboard from Connecticut to Mexico.

The Otho Skipper

Thymelicus otho (Thy-mel'i-cus o'tho)

Plate, XLI, Fig. 1, 2, 3, 4, 5, 6

(1) The Typical Form, *Thymelicus otho otho*.—The upper surface of the wings is dark brown more or less shaded with

tawny and with tawny spots. In the *male* the upper surface of the fore wings bears a brand which consists of two velvety black patches separated by a patch of large scales of a lighter color; the dark outer border of the wing extends to the brand except that there is a yellow spot in cell M_3 and Cu_1; between the brand and the costal margin of the wing there is a more or less distinct band of yellow which extends from the base of the wing nearly to the subapical row of spots; the central portion of the hind wings is tinged with yellow but without well-defined spots. In the *female* the yellow border along the costal margin of the wings is much less distinct.

The lower surface of the wings in both sexes is yellowish brown; on the fore wings there is a dark shade parallel with the inner margin and covering nearly half of the wing; and the yellow markings of the upper surface are faintly indicated. Expanse of wings one and one-fifth to one and one-fourth inches.

(2) The Dark Form, *Thymelicus otho egeremet* (e-ger'e-met).—This form is represented by both sexes. The upper surface of the wings is a blackish brown with almost no tawny shading, there are, however, long greenish-yellow hairs near the base of the inner margin of the fore wings, and over a large portion of the hind wings; the transverse row of spots beyond the middle of the fore wings is present but is abbreviated, lacking the spot at each end of the row.

The species is found throughout the eastern United States; the larva feeds on grasses. Otho is a Roman surname.

Plate XLI.

PLATE XLI

SKIPPERS WITH A BRAND AND THEIR ALLIES

Fig.

1, 2, 3. The Otho Skipper, the Typical Form, *Thymelicus otho otho;* 1, male; 2, female; 3, lower side of wings.

4, 5, 6. The Otho Skipper, the Dark Form, *Thymelicus otho egeremet;* 4, male; 5, female; 6, lower side of wings.

7, 8, 9. The Tawny-edged Skipper, *Thymelicus cernes;* 7, male; 8, female; 9, lower side of wings.

10, 11, 12. The Yellow Spot, *Polites peckius;* 10, male; 11, female; 12, lower side of wings.

13, 14, 15. The Little Glass-wing, *Euphyes verna;* 13, male; 14, female; 15, lower side of wings.

16, 17, 18. The Black Dash, *Limochores pontiac;* 16, male; 17, female; 18, lower side of wings.

Plate XLI.

The Long Dash

Thymelicus mystic (Thy-mel'i-cus mys'tic)

Plate XL, Fig. 16, 17, 18

The upper surface of the fore wings are largely tawny with a broad brown outer margin ; there is also a brown patch at the base back of cell R + M and one beyond the end of this cell ; in the male there is a long narrow brand which is continued by the brown patch beyond the end of cell R + M. On the hind wings the brown outer margin is narrower than that of the fore wings. The female resembles the female of the sachem, but differs in that all of the spots in the transverse row beyond the middle of the fore wings are tawny, not translucent.

On the lower side the ground color of the wings is orange buff in the male and cinnamon brown in the female.

Expanse of wings one and one-third inches.

The popular name was suggested by the long narrow brand of the male. The skipper has been found in New England and the northern part of the Middle States. The larva feeds on grasses.

The Tawny-Edged Skipper

Thymelicus cernes (Thy-mel'i-cus cer'nes)

Plate XLI, Fig. 7, 8, 9

Hind wings dark brown both above and below and without markings ; the fore wings dark brown with a large costal tawny patch in the male and an obscure costal tawny streak in the female ; male with a velvety black brand ; female with a

transverse row of spots beyond the middle of the fore wings. A rather small species expanding less than one and one-fifth inches.

The species is distributed throughout the United States east of the Rocky Mountains. The larva feed on grasses. The common name was probably suggested by the tawny patch along the costal margin of the fore wings.

The Yellow Spot

Polites peckius (Po-li'tes peck'i-us)

Plate XLI, Fig. 10, 11, 12

The upper surface of both fore and hind wings is dark brown with a row of yellow spots beyond the middle of each, and the costal border is more or less yellow. The male has a velvety black brand which is sinuous and interrupted before the middle. Lower surface of the wings cinnamon brown, with the markings of the upper surface repeated in yellow; on the hind wings there is a large central yellow patch covering more than half of the wing. This is a small species expanding from seven-eighths inch to one inch.

The species was named in honor of Professor Peck, one time of Cambridge, Mass. The common name was suggested by the yellow spots on the wings. The skipper is found in Canada and in the Northern States, west to Kansas.

The Little Glass-wing

Euphyes verna (Eu'phy-es ver'na)

Plate XLI, Fig. 13, 14, 15

The upper surface of both fore and hind wings is a dark rich brown ; the fore wings with a transverse row of white or translucent spots beyond the middle and a small one near the outer end of cell R + M ; the hind wings without spots or with merely traces of them ; the brand of the male is slender, inconspicuous, and blackish. On the lower surface the spots of the fore wings are repeated, and there may be a faint row of spots beyond the middle of the hind wings.

See table, page 266, for distinctions between this species and the female of the cross-line skipper, which it closely resembles.

Expanse of wings one and one-eighth to one and one-fourth inches.

The species is distributed from New York westward to Kansas and southward along the Alleghany Mountains. The popular name was probably suggested by the resemblance in appearance to some of the larger skippers with translucent spots on the wings.

The Dun Skipper

Euphyes vestris (Eu'phy-es ves'tris)

Plate XLII, Fig. 3, 4, 5, 6

This is a dark glossy brown species either without light markings or with a few small spots, and in which the terminal crook of the antennæ is longer than the width of the club.

In the *male* of the typical form there are no whitish or

tawny spots on the wings either above or below; the brand is velvety black and consists of two patches slightly separated by vein Cu. In the *female* there are two whitish or yellow spots on the fore wings: one in cell M_3 and a smaller one in cell M_2.

The Metacomet Form, *Euphyes vestris metacomet.*—This differs from the typical form by a slightly greater amount of light markings, and was long considered a distinct species. On the fore wings of the female there are, in addition to the two spots in cells M_2 and M_3, two smaller ones in cells R_4 and R_5; and on the lower side of the hind wings there is a transverse row of light spots faintly indicated beyond the middle of the wing.

Metacomet was the Indian name of the celebrated King Philip, and was given to this form by Harris, who considered it a distinct species. It is widely distributed in the Mississippi Valley and in the Northern States.

The Swarthy Skipper

Euphyes fusca (Eu'phy-es fus'ca)

Plate XLII, Fig. 1

This is a small dark brown species without distinct whitish or tawny spots either above or below; even the brand is lacking in the male. Sometimes there are a few yellow scales in some of the places occupied by the transverse row of spots of the fore wings in other species. Expanse of wings about one inch.

This is a Southern species, found in the Gulf States and as far north as Pennsylvania.

Plate XLII

PLATE XLII

SKIPPERS WITH A BRAND AND THEIR ALLIES

Fig.

1. The Swarthy Skipper, *Euphyes fusca*.
2. The Brazilian Skipper, *Calpodes ethlius*.
3. The Dun Skipper, the Typical Form, *Euphyes vestris vestris*.
4, 5, 6. The Dun Skipper, the Metacomet Form, *Euphyes vestris metacomet;* 4, male; 5, female; 6, lower side of wings.
7, 8, 9, 10. The Cross-line Skipper, *Limochores manataaqua;* 7, male; 8, female; 9, lower side of wings of female; 10, lower side of wings of male.
11, 12. The Broad-winged Skipper, *Phycanassa viator;* 11, upper side; 12, lower side of wings.
13, 14, 15. The Vitellius Skipper, *Phycanassa vitellius;* 13, male; 14, female; 15, lower side of wings.

Plate XLII.

The Brazilian Skipper

Calpodes ethlius (Cal-po'des eth'li-us)

Plate XLII, Fig. 2

An unusually large species, the wings expanding two inches or more. The upper surface is dark blackish brown, with some yellow hairs over the basal portions of the wings; there are seven whitish, translucent spots on the fore wings, and three, the first of which is often double, upon the hind wings; the arrangement of these spots is shown in the figure; there is no trace of a brand in the male.

On the lower side the wings are ochraceous brown except a blackish area on the fore wings extending from cell R + M to the inner margin; the spots of the upper side are repeated.

This magnificent skipper is the largest of the subfamily Pamphilinæ found in the East. It occurs only in the southern part of our territory, but it extends southward to the Argentine Republic. The larva feeds on the leaves of *Canna*.

The Black Dash

Limochores pontiac (Li-moch'o-res pon'ti-ac)

Plate XLI, Fig. 16, 17, 18

In the *male* the upper surface of the wings is dark blackish brown with the discal portion of both wings and the base of the fore wings yellow, except that most of the veins are covered with brown; the brand is black and nearly or quite divided into two patches; the dark outer margin of the fore wings does not extend to the brand.

In the *female* the upper surface is dark brown with a transverse row of yellow spots on both wings.

The lower surface in both sexes is cinnamon brown with a transverse row of yellow spots on both wings. On the fore wings there is a blackish shade extending from cell R + M to the inner margin, and this is not interrupted by a light colored patch in cell Cu_2, or at the most there is a diffused indistinct patch. Expanse of wings one and one-fourth inches or more.

The species occurs in a narrow belt from Massachusetts to Nebraska and south to New Jersey. The common name refers to the shape and color of the brand of the male.

The Cross-line Skipper

Limochores manataaqua (Li-moch'o-res man-a-ta'a-qua)

Plate XLII, Fig. 7, 8, 9, 10

In the *male* the wings are dark brown marked and tinged with yellow; the brand is very slender and nearly straight; outside of it there is a patch of brown scales, which makes it appear wider than it is; between the brand and the costal margin the wing is heavily covered with yellow scales, and the transverse row of spots beyond the middle of the wing is more or less distinct; the hind wings are tinged with yellow, sometimes the transverse row of spots is faintly indicated.

In the *female* the wings are dark brown above with a transverse row of whitish spots beyond the middle of the fore wing; hind wings without spots. See table, page 266, for distinctions between the female of this species and that of the little glass-wing, which it very closely resembles.

Expanse of wings one inch to one and one-third inches.

The common name was probably suggested by the linear form of the brand of the male. The species occurs from New England to Nebraska in a rather narrow belt of country. The larva feeds on grasses.

The Broad-Winged Skipper

Phycanassa viator (Phyc-a-nas'sa vi-a'tor)

Plate XLII, Fig. 11, 12

The wings are blackish brown marked with dull tawny; on the fore wings there is a double yellow spot in the outer end of cell R + M, a transverse row of spots beyond the middle, and a long yellow bar in cell Cu; the disk of the hind wings is yellow broken into long spots by the brown veins. There is no trace of a brand in the male.

Excepting the Brazilian skipper, this is the largest member of this subfamily found in the East, expanding one and one-fourth to one and one-half inches or more. The wings are relatively narrow and long, the common name referring to the breadth of expanse rather than to the breadth of the wings measured from the costal to the inner margin. The species occurs in the Atlantic States from New England to the Gulf of Mexico.

The Vitellius Skipper

Phycanassa vitellius (Phyc-a-nas'sa vi-tel'li-us)

Plate XLII, Fig. 13, 14, 15

The upper surface of the wings is largely bright tawny with the veins and outer margin brown; in the male the brown border on the outer margin is unusually narrow, covering only about one-eighth of the length of the wing; in the female it is about twice as wide; the base of the wings is more or less dusky, especially in the female, where the basal two-fifths of the wing is brownish; there is a more or less distinct brown bar at the end of cell R + M, but no trace of a brand in the male. The lower surface of the hind wings is yellow without markings.

Expanse of wings one and one-eighth to one and one-fourth inches.

The species *vitellius* was first described from the West Indies, and it may be that our form is distinct; if so, it should be known under the name *logan*, given to it by Mr. Edwards. It is found as far north as New England and Montana.

SKIPPERS WITH A COSTAL FOLD AND THEIR ALLIES

Subfamily Hesperiinæ (Hes-pe-ri-i'næ)

This subfamily includes the larger of the common skippers, as well as some that are of moderate size. Most of the species are dark brown, marked with white or translucent, angular spots. The antennæ usually have a long club, which is bent

at a considerable distance from the tip (Fig. 46), and vein M_2 of the fore wings retains its primitive position midway between veins M_1 and M_3 or is nearer to vein M_1 than to M_3 at base (Fig. 47). But the most distinctive feature of the subfamily is exhibited by the males alone, and is lacking in some species. It consists of a fold in the fore wing near the costal margin, which forms a long, slit-like pocket, containing a sort of silky down. This, like the brand of the males of the preceding subfamily, is a scent-organ, tubular scales, the *androconia*, that are the outlets of scent glands, opening into it. When the pockets are tightly closed it is difficult to see them; Plate XLV, Fig. 6, represents a specimen in which they are open.

FIG. 46.—Martial's dusky-wing.

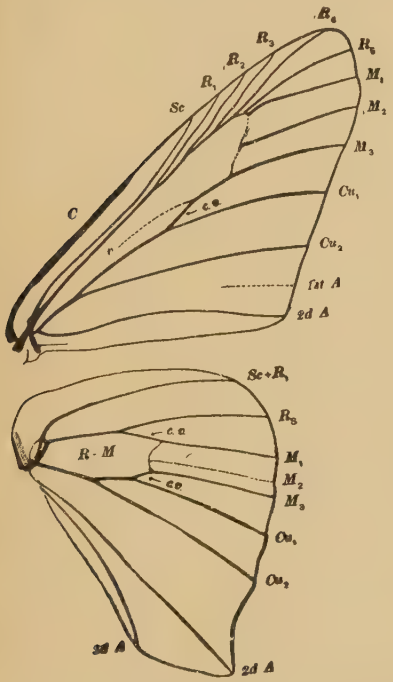


FIG. 47.—Venation of the wings of *Epargyreus tityrus*.

Nearly eighty species belonging to this subfamily have been found in America north of Mexico. Those that occur in the East, except a few rare ones and a few Southern forms, are

described below, and can be separated by the following table :

A. The hind wings furnished with long tails. (*E. proteus*), p. 292. THE LONG-TAILED SKIPPER.

AA. The hind wings not furnished with long tails.

B. Fore wings with a broad, bright yellow band near the middle.

C. With a large silvery-white spot in the center of the lower side of the hind wings. (*E. tityrus*), p. 293. THE SILVER-SPOTTED SKIPPER.

CC. Without a silvery-white spot in the center of the lower side of the hind wings.

D. The greater part of the outer half of the lower side of the hind wings white. (*A. lycidas*), p. 295. THE HOARY-EDGE.

DD. Lower side of hind wings dark brown throughout. (*R. cellus*), p. 294. THE GOLDEN-BANDED SKIPPER.

BB. Fore wings not crossed with a broad, bright yellow band.

C. Upper surface of wings black or brown, with a few white spots on the fore wings or with none, hind wings not checkered with white.

D. Club of antennæ hooked ; anal angle of hind wings slightly prolonged.

E. The white spots on the middle of the fore wings forming an almost continuous band. (*T. bathyllus*), p. 295. THE SOUTHERN CLOUDY-WING.

EE. The white spots on the fore wings small, not forming an almost continuous band. (*T. pylades*), p. 296. THE NORTHERN CLOUDY-WING.

DD. Club of antennæ sickle-shaped; anal angle of hind wings rounded.

E. Small species, expanding about one inch. (*P. catullus*), p. 297. THE SOOTY-WING.

EE. Larger species.

F. Fore wings without white spots.

G. Fore wings with a hoary patch just beyond the middle of the wing and extending from the costal margin nearly half-way to the inner margin. (*T. icelus*), p. 298. THE DREAMY DUSKY-WING.

GG. Fore wings without hoary patch. (*T. brizo*), p. 297. THE SLEEPY DUSKY-WING.

FF. Fore wings with small white spots near the apex of the wing.

G. The dark spots of the upper surface of the wings neither well-defined nor in striking contrast to the ground color.

H. The transverse paler band crossing the fore wings just beyond cell R + M fairly well-defined by a darker band on each side of it. (*T. lucilius*), p. 298. LUCILIUS'S DUSKY-WING.

HH. The transverse pale band on fore wings not well-defined. (*T. persius*), p. 299. PERSIUS'S DUSKY-WING.

GG. The dark spots on the upper surface of the wings, well-defined, giving the wings a checkered appearance.

H. Species expanding about one and one-fourth inches, the checkered appearance of the wings well-marked. (*T. martialis*, p. 299. MARTIAL'S DUSKY-WING.

HH. Species expanding about one and one-half inches; the checkered appearance of the wings less obvious. (*T. juvenalis*), p. 300. JUVENAL'S DUSKY-WING.

CC. Both fore and hind wings checkered with many white spots.

D. The white spots in the band just beyond the middle of the fore wings much broader than high. (*H. tessellata*), p. 300. THE TESSELLATE SKIPPER.

DD. The white spots in the band just beyond the middle of the fore wings but little if any broader than high. (*H. centaureæ*), p. 301. THE GRIZZLED SKIPPER.

THE LONG-TAILED SKIPPER

Eudamus proteus (Eu'da-mus pro'te-us)

PLATE XLIV, FIG. 1

This skipper by the shape of its wings reminds one of a swallow-tail butterfly, the hind wings being furnished with long tails. It expands about one and three-fourths inches, and the greatest length of the hind wings is about one and one-fourth inches. The wings are very dark chocolate-

brown; the front wings contain several silvery-white spots; and the body and base of the wings bear metallic-green hairs.

The larvæ feed upon both Leguminosæ and Cruciferæ. In the South it is sometimes a pest in gardens, cutting and rolling the leaves of beans, turnips, and cabbage, and feeding within the rolls thus formed. It is found on the Atlantic border from New York southward into Mexico.

The Silver-spotted Skipper

Epargyreus tityrus (Ep-ar-gy're-us tit'y-rus)

Plate XLIV, Fig. 3, 5; Plate XLIII

This skipper resembles the two following species in being dark chocolate-brown, with a row of yellowish spots extending across the fore wings; but it is distinguished by a large silvery-white spot in the center of the lower side of the hind wings. The anal angle of the hind wings is prolonged into a short tail. Expanse of wings nearly or quite two inches.

The silver-spotted skipper is found in nearly the whole United States, from Massachusetts to California, except in the extreme Northeast and Northwest. The larva (Fig. 48) feeds upon various papilionaceous plants. We have found it

Fig. 48.—Larva of the silver-spotted skipper.

common on locust. It makes a nest, within which it remains concealed, by fastening together, with silk, the leaflets of a compound leaf (Fig. 49).

FIG. 49.—Nest of the larva of the silver-spotted skipper.

THE GOLDEN-BANDED SKIPPER

Rhabdoides cellus (Rhab-doi'des cel'lus)

PLATE XLIV, FIG. 2

This resembles the preceding and the following species in being dark chocolate-brown, with a yellow band across the middle of the fore wings; but in this species the band is larger than in either of the other species, and is more nearly continuous, being broken to a less extent by brown scales upon the wings. It differs also from the other two species in having the lower side of the hind wings dark brown throughout. It expands about two inches.

This species is found from West Virginia to the Gulf of Mexico.

PLATE XLIII

THE SILVER-SPOTTED SKIPPER

Fig.

1. Pupæ removed from their cocoons.
2. Larvæ.

(From photographs by Professor M. V. Slingerland, colored by Mrs. Slingerland.)

Plate XLIII.

The Hoary-edge

Achalarus lycidas (A-chal'a-rus lyc'i-das)

Plate XLIV, Fig. 4, 7

The upper surface of the wings is chocolate-brown, with a transverse row of yellow spots across the middle of the fore wings, resembling in this respect the silver-spotted skipper. But in this species the anal angle of the hind wings is rounded, and the greater part of the outer half of the lower side of the hind wings is white. Expanse of wings about two inches.

The common name refers to the large hoary patch on the outer margin of the lower side of the hind wings. This insect is found from Massachusetts to the Gulf of Mexico and in the Mississippi Valley. The larva feeds on tick-trefoil, *Desmodium.*

The Southern Cloudy-wing

Thorybes bathyllus (Thor'y-bes ba-thyl'lus)

Plate XLIV, Fig. 8

There are two common skippers representing the genus Thorybes and popularly known as the Southern cloudy-wing and the Northern cloudy-wing respectively that resemble each other closely. They differ from the preceding species of Hesperiinæ in lacking the long tails of the first and the yellow bands of the other three, and from the following species in having the club of the antennæ hooked. The wings are dark brown; the fore wings are flecked with small or very small irregular white spots, and the hind wings are crossed

beneath by two rather narrow, parallel, inconspicuous darker bands.

In the Southern cloudy-wing the white spots are larger than in the following species, almost forming a continuous band. Expanse of wings nearly or quite one and one-half inches.

This species has been found from West Virginia to Florida, and westward to Kansas and New Mexico. The larva feeds on wild bean and other herbaceous Leguminosæ.

This and the following species, which it closely resembles, were named after two rivals. Bathyllus was a very celebrated pantomime of Alexandria, and a favorite of Mæcenas.

The Northern Cloudy-wing

Thorybes pylades (Thor'y-bes pyl'a-des)

Plate XLIV, Fig. 9

In the Northern cloudy-wing the white spots on the fore wings are usually mere points, although their number and size vary. For other characteristics see description of the preceding species.

This species is found in nearly all parts of the United States. The larva commonly feeds on clover.

Pylades was a celebrated pantomimist from Cilicia, under Augustus. See preceding species.

PLATE XLIV

SKIPPERS WITH A COSTAL FOLD AND THEIR ALLIES

1. The Long-tailed Skipper, Urbanus proteus.
2. The Golden-banded Skipper, Autochton cellus.
3. The Silver-spotted Skipper, Epargyreus tityrus.
4. The Hoary-edge, Achalarus lyciades.
5. The Silver-spotted Skipper, lower side of wings.
6. The Sooty-wing, Pholisora catullus.
7. The Hoary-edge, lower side of wings.
8. The Southern Cloudy-wing, Thorybes bathyllus.
9. The Northern Cloudy-wing, Thorybes pylades.

PLATE XLIV

SKIPPERS WITH A COSTAL FOLD AND THEIR ALLIES

Fig.

1. The Long-tailed Skipper, *Eudamus proteus*.
2. The Golden-banded Skipper, *Rhabdoides cellus*.
3. The Silver-spotted Skipper, *Epargyreus tityrus*.
4. The Hoary-edge, *Achlarus lycidas*.
5. The Silver-spotted Skipper, lower side of wings.
6. The Sooty-wing, *Pholisora catullus*.
7. The Hoary-edge, lower side of wings.
8. The Southern Cloudy-wing, *Thorybes bathyllus*.
9. The Northern Cloudy-wing, *Thorybes pylades*.

PLATE XLIV, FIG. 9

Plate XLIV.

The Sooty-wing

Pholisora catullus (Phol-i-so'ra ca-tul'lus)

Plate XLIV, Fig. 6

The wings are nearly black, with a transverse row of minute white spots parallel with the outer border of the fore wings. This species can be distinguished from all other dark-colored Hesperiinæ described in this book by its small size, the wings expanding only about one inch.

This species is found throughout the United States except along the extreme northern border. The larva feeds on pigweed, *Chenopodium.*

The Sleepy Dusky-wing

Thanaos brizo (Than'a-os bri'zo)

Plate XLV, Fig. 2

The wings are dark brown without white spots. The fore wings are crossed from the costal margin to the anal vein by two transverse bands, one before the middle, the other beyond the middle. The edges of these bands are dark blackish brown, the center gray. Nearly all of the upper surface of the fore wings is flecked with white hairs; but these are not appreciably more abundant between the transverse bands than elsewhere. Expanse of wings one and one-third to one and one-half inches.

This species is distributed over the larger part of the United States except the far Northwest.

The Dreamy Dusky-wing

Thanaos icelus (Than'a-os i-ce'lus)

Plate XLV, Fig. 1

The upper surface is blackish brown, the fore wings sprinkled with pale bluish scales; these are most abundant on the outer half of the wing; and just beyond the middle of the wing, they form a distinct hoary patch, which extends from the costal margin nearly half-way to the inner margin. There are no distinct white spots on the fore wings as in the following species. The hind wings have two irregular rows of dull yellow spots parallel with the outer margin. Expanse of wings from one and one-tenth to one and one-fourth inches.

This skipper is found in nearly all parts of the United States. The larva will feed on aspen.

Lucilius's Dusky-wing

Thanaos lucilius (Than'a-os lu-cil'i-us)

Plate XLV, Fig. 4

The wings are dark brown above with a row of small white spots just before the apex of the fore wings and a single one in cell M_3. The fore wings are crossed just beyond the middle by a transverse paler band, which is fairly well defined; this is the most important characteristic distinguishing this species from the following. Expanse of wings from one and one-tenth to one and one-fourth inches.

This species is found in the Atlantic States. The larva feeds on the wild columbine and on pigweed.

PLATE XLV

SKIPPERS WITH A COSTAL FOLD AND THEIR ALLIES

Fig.

1. The Dreamy Dusky-wing, *Thanaos icelus.*
2. The Sleepy Dusky-wing, *Thanaos brizo.*
3. Persius's Dusky-wing, *Thanaos persius;* male, with the costal folds open.
4. Lucilius's Dusky-wing, *Thanaos lucilius.*
5. Martial's Dusky-wing, *Thanaos martialis.*
6. Juvenal's Dusky-wing, *Thanaos juvenalis.* Male, with the costal folds open.
7. The Tessellate Skipper, *Hesperia tessellata.*
8. The Grizzled Skipper, *Hesperia centaureæ.*

Plate XLV.

Persius's Dusky-wing

Thanaos persius (Than'a-os per'si-us)

Plate XLV, Fig. 3

The wings are dark brown above with a row of small white spots just before the apex of the fore wings and a single one in cell M_3, as in the preceding species. On the fore wings there is a transverse pale band just beyond the middle of the wings, but this band is not as well defined as in the preceding species. Expanse of wings from one and two-tenths to one and four-tenths inches.

This skipper is found over a large part of the United States. The larva feeds on willow and poplar.

Martial's Dusky-wing

Thanaos martialis (Than'a-os mar-ti-a'lis)

Plate XLV, Fig. 5

The wings are brown above, conspicuously marked with spots of a darker shade; the spots are well defined and give the wings a checkered appearance. There is a row of small white spots just before the apex of the fore wing, one in cell M_3, and one more or less distinct in cell $R+M$.

This species differs from the following, which it most closely resembles of all our Eastern species, by its smaller size and the more strongly contrasting colors. Expanse of wings about one and one-fourth inches.

This species is distributed throughout the Atlantic States and westward to Colorado.

Juvenal's Dusky-wing

Thanaos juvenalis (Than'a-os ju-ve-na'lis)

Plate XLV, Fig. 6

The wings are dark brown marked with brown spots of a darker shade, and with small white spots on the fore wings. This insect can be distinguished from the preceding species, which it most closely resembles of all our Eastern species, by its larger size, and the fact that the checkered appearance of the wings is less obvious. Expanse of wings about one and one-half inches.

It has been found throughout the eastern United States except perhaps the Northwest. The larva feeds on oak.

The Tessellate Skipper

Hesperia tessellata (Hes-pe'ri-a tes-sel-la'ta)

Plate XLV, Fig. 7

Wings blackish brown largely checkered with white; more than one-half of the outer two-thirds of both and hind wings being white. In this species the white spots in the band just beyond the middle of the fore wings are much broader than high. Expanse of wings about one and two-tenths inches.

This insect is found throughout nearly the whole United States. The larva feeds on hollyhocks and Indian mallow.

The Grizzled Skipper

Hesperia centaureæ (Hes-pe'ri-a cen-tau're-æ)

Plate XLV, Fig. 8

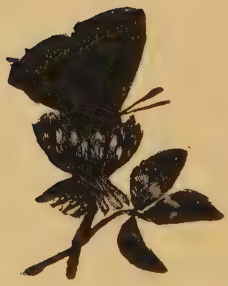
Wings blackish brown conspicuously checkered with white, and with the fringe of the wings white interrupted at the ends of the veins with the ground color of the wings. This species differs from the preceding in the smaller amount of white markings ; the white spots in the band just beyond the middle of the wing are but little if any broader than high. Expanse of wings one and one-fourth inches.

This pretty species has been taken in widely separated localities : New York, West Virginia, Colorado, Labrador, Norway, and Lapland. Nothing is known regarding its early stages.

I, who take root and firmly cling,
Thought fixedness the only thing ;
  Why Nature made the butterflies
(Those dreams of wings that float and hover
At noon the slumberous poppies over),
  Was something hidden from mine eyes,

Till once, upon a rock's brown bosom,
Bright as a thorny cactus-blossom,
  I saw a butterfly at rest ;
Then first of both I felt the beauty ;
The airy whim, the grim-set duty
  Each from the other took its best.

Lowell.



INDEX

Abbot, 88, 197, 235.
Abdomen, 16.
Acadian Hair-streak, The, 224.
acadica, Thecla, 224.
Achalarus lycidas, 295.
Agapetidæ, 180.
Agraulis vanillæ, 107.
ajax ajax, Iphiclides, 49.
ajax, Iphiclides, 49.
ajax marcellus, Iphiclides, 49.
ajax telamonides, Iphiclides, 49.
Akers, Elizabeth, 137, 200.
alba, Eurema euterpe, 99.
alope, Cercyonis, 184.
Amblyscirtes samoset, 271.
  vialis, 270.
American Copper, The, 241.
Anal angle, 7.
Anal veins, 9.
Analytical tables, Method of using, 37.
Ancyloxipha numitor, 272.
andria, Anœa, 177.
Androconia, 19, 262, 289.
Angles of wings, 7.
Angle-wings, The, 131.
Anœa andria, 177.
Anosia berenice, 173, 207.
  berenice strigosa, 208.
  plexippus, 204.
Antennæ, 4.
Anthomaster leonardus, 277.
antiopa, Euvanessa, 148.
Apex, 6.
aphrodite, Argynnis, 117.
Apostraphia charithonia, 201.
aragithe, Phœbis, 90.
archippus, Basilarchia, 170.
Arctic Skipper, The, 272.
Argynnis aphrodite, 117.
  atlantis, 118.
  cybele, 114.
Arnold, 143.
arthemis, Basilarchia, 167.
asterias, Papilio, 63.
astyanax, Basilarchia, 166.
atalanta, Vanessa, 154.
atlantis, Argynnis, 118.
Atlides halesus, 220.
Atrytone hobomok, 275.
  zabulon, 274.
augustus, Incisalia, 231.

bachmani, Hypatus, 210.
Baltimore, The, 125.
Banded Elfin, The, 234.
Banded Hair-streak, The, 226.
Banded Purple, The, 167.
Basilarchia archippus, 170.
  arthemis, 167.
  astyanax, 166.
  floridensis, 173.
  proserpina, 170.
bathyllus, Thorybes, 295.
bellona, Brenthis, 119.
berenice, Anosia, 207.

Black Dash, The, 285.
Black Swallow-tail, The, 62.
Blown larva, 34.
Blue Swallow-tail, The, 66.
Blue-eyed Grayling, The, 186.
Blues, The, 244.
borealis, Calephelis, 214.
Brazilian Skipper, The, 285.
Breeding-cage, 27.
Brenthis bellona, 119.
myrina, 122.
brettus, Thymelicus, 279.
brevicauda, Papilio, 61.
brizo, Thanaos, 297.
Broad-winged Skipper, The, 287.
Bronze Copper, The, 239.
Brown Elfin, The, 231.
Browning, 55, 221.
Buckeye, The, 160.

Cabbage Butterfly, The, 78.
Cabinet, 33.
cænius, Calephelis, 213.
cæsonia, Zerene, 90.
calanus, Thecla, 226.
Calephelis borealis, 214.
cænius, 213.
Callidryas eubule, 88.
philea, 87.
Calpodes ethlius, 285.
Calycopis cecrops, 231.
Camberwell Beauty, The, 150.
campestris, Hylephila, 278.
Canadian Skipper, The, 276.
canthus, Satyrodes, 191.
Caraway-worms, 63.
cardui, Vanessa, 158.
Carolinian Satyr, The, 199.
Cary, Alice, 191.
Caterpillars, 21.
catullus, Pholisora, 297.
cecrops, Calycopis, 231.
Cells of the wing, 14.
cellus, Rhabdoides, 294.
celtis, Chlorippe, 174.
centaureæ, Hesperia, 301.
Cercyonis alope, 184.
alope alope, 185.
alope nephele, 185.
pegala, 188.
cernes, Thymelicus, 281.
Charidryas nycteis, 127.
charithonia, Apostraphia, 201.
Checkered White, The, 73.
Chlorippe celtis, 174.
clyton, 175.
Chrysalis, 20.
Chrysophanus thoe, 239.
Cinclidia harrisii, 126.
Cissia eurytus, 197.
sosybius, 199.
Classification of butterflies, 35.
claudia, Euptoieta, 109.
Claws, 5.
Clothing of Butterflies, 16.
Clouded Sulphur, The, 92.
Cloudless Sulphur, The, 88.
clyton, Chlorippe, 175.
Cobweb Skipper, The, 277.
Cocoon, 23.
cœnia, Junonia, 160.
Cofaqui Skipper, The, 258.
cofaqui, Megathymus, 258.
Coleridge, 167.
Collecting-box, 30.
comma, Erynnis, 276.
comma, Polygonia, 140.
Common Skippers, The, 260.
Compound Eyes, 4.
Compton Tortoise, The, 146.

comyntas, Everes, 254.
Coppers, The, 236.
Coral Hair-streak, The, 234.
Cosmopolite, The, 158.
Costa, 6, 9.
Costal margin, 6.
Coxa, 5.
Crescent-spots, The, 123.
cresphontes Papilio, 57.
Cross-line Skipper, The, 286.
Cross-veins, 9.
cruciferarum, Pieris napi, 76.
Cubitus, 9.
Cyanide of potassium, 29.
Cyaniris ladon, 249.
ladon ladon, 251.
ladon lucia, 250.
ladon marginata, 250.
ladon neglecta, 251.
ladon violacea, 250.
ladon violacea-nigra, 250.
cybele, Argynnis, 114.

Dainty Sulphur, The, 86.
damon, Mitoura, 229.
Diana Fritillary, The, 110.
diana, Semnopsyche, 110.
Dickinson, Emily, 230, 244.
Discal cell, 15.
Dog's-head, The, 90.
Dreamy Dusty-wing, The, 298.
Dull-eyed Grayling, The, 185.
Dun Skipper, The, 283.

Edwards, 49, 98, 187, 212, 251, 253.
egeremet, Thymelicus otho, 280.
Eggs, 20.
Emperors, The, 173.
Enodia portlandia, 189.
Epargyreus tityrus, 293.
Epidemia epixanthe, 240.
epixanthe, Epidemia, 240.
Erynnis comma, 276.
metea, 277.
sassacus, 276.
ethlius, Calpodes, 285.
eubule, Callidryas, 88.
Eudamus proteus, 292.
Euphydryas phaeton, 125.
Eugonia j-album, 146.
Euphyes fusca, 284.
verna, 283.
vestris, 283.
Eupsyche m-album, 221.
Euptoieta claudia, 109.
Eurema euterpe, 98.
nicippe, 97.
eurydice, Satyrodes, 192.
Eurymus eurytheme, 95.
philodice, 92.
eurytheme, Eurymus, 95.
eurytus, Cissia, 197.
euterpe, Eurema, 98.
Euvanessa antiopa, 148.
Everes comyntas, 254.
Exuviæ, 23.
Eyed Brown, The, 191.
Eyes, 3.

fabricii, Polygonia, 135.
Falcate Orange-tip, The, 82.
faunus, Polygonia, 138.
Femur, 5.
Feniseca tarquinius, 237.
floridensis, Basilarchia, 173.
Folded papers for butterflies, 31.
Fritillaries, The, 104.
fusca, Euphyes, 284.

gemma, Neonympha, 194.
Gemmed Brown, The, 194.
genutia, Synchloe, 82.
Georgian Satyr, The, 196.
Giant Skippers, The, 258.
Giant Swallow-tail, The, 56.
glaucus glaucus, Papilio, 52.
glaucus, Papilio, 51.
glaucus turnus, Papilio, 51.
Goatweed Emperor, The, 177.
Golden-banded Skipper, The, 294.
Gossamer-winged Butterflies, The, 215.
Gray Comma, The, 143.
Gray Emperor, The, 174.
Gray Hair-streak, The, 223.
Grayling, The, 184.
Grayling, The Sea-coast, 185.
Graylings, Hybrid, 185.
Gray-veined White, The, 75.
Great Purple Hair-streak, The, 220.
Great Southern White, The, 72.
Great Spangled Fritillary, The, 114.
Green-clouded Swallow-tail, The, 59.
Green Comma, The, 138.
Grizzled Skipper, The, 301.
Gulf Fritillary, The, 107.

Hair-streaks, The, 217.
halesus, Atlides, 220.
harrisii, Cinclidia, 126.
harrisii, Polygonia comma, 140.
Harris's Butterfly, 126.
Hay, John, 209.
Head, 3.
Heliconians, The, 201.
Heliconidæ, 201.
Heodes hypophlæas, 241.
Hesperia centaureæ, 301,
Hesperia tessellata, 300.
Hesperiidæ, 260.
Hesperiinæ, 261, 288.
Hesperioidea, 256.
Hexapoda, 2.
Higginson, T. W., 65, 98, 160 207, 254.
Hinsdale, Laura F., 101.
Hoary-edge, The, 295.
Hoary Elfin, The, 233.
hobomok, Atrytone, 275.
Hop-merchant, The, 140.
Humeral angle, 6.
Humeral cross-vein, 10.
Humeral vein, 14.
Hunt, Helen, 94.
huntera, Vanessa, 156.
huron, Hylephila, 279.
Hybrid Purple, The, 170.
Hylephila campestris, 278.
Hypatus bachmani, 210.
hypophlæas, Heodes, 241.

icelus, Thanaos, 298.
idalia, Speyeria, 112.
immaculata, Pieris rapæ, 78.
Incisalia augustus, 231.
irus, 233.
niphon, 234.
Indian Skipper, The, 276.
Inflating larvæ, 34.
Ingelow, Jean, 162, 184.
Inner margin, 6.
Insect net, 29.
Insect-pins, 31.
interrogationis, Polygonia, 134.
iole, Nathalis, 86.

Iphiclides ajax, 49.
ajax marcellus, 49.
ajax telamonides, 49.
ajax walshii, 49.
irus, Incisalia, 233.
Ithomiidæ, 38.

j-album, Eugonia, 146.
Junonia cœnia, 160.
juvenalis, Thanaos, 300.
Juvenal's Dusky-wing, 300.

Keats, 119.
Kellogg, 17, 20.
Killing-bottle, 29
Kipling, 203.

ladon, Cyaniris, 249.
Laertias philenor, 66.
Larcom, Lucy, 187.
Large Metal-Mark, The, 214.
Large Orange-sulphur, The, 90.
l-argentum, P. progne, 143.
Larva, 21.
Least Purple Hair-streak, The, 231.
Least Skipper, The, 272.
Legs, 5.
Leonard's Skipper, 277.
leonardus, Anthomaster, 277
Lepidoptera, 3.
Libytheidæ, 210.
Limochores manataaqua, 286.
pontiac, 285.
liparops, Thecla, 228.
Little Glass-wing, The, 283.
Little Sulphur, The, 98.
Little Wood-satyr, The, 197.
logan, Phiĉanassa, 288.
Long Dash, The, 281.
Long-beaks, The, 210.
Longitudinal veins, 9.
Long-tailed Skipper, The, 292.
Lowell, 87, 240, 301.
lucia, Cyaniris ladon, 250.
lucilius, Thanaos, 298.
Lucilius's Dusky-wing, 298.
Lycænidæ, 215.
lycidas, Achalarus, 295.
lygdamus, Nomiades, 245.
Lymnadidæ, 204.

m-album, Eupsyche, 221.
manataaqua, Limochores, 286.
marcellus, Ajax, 49.
marcia, Phyciodes, 130.
marginata, Cyaniris ladon, 250.
Margins of wings, 6.
maritima, Cercyonis alope, 185.
Martial's Dusky-wing, 299.
martialis, Thanaos, 299.
massasoit, Poanes, 273.
Maxillæ, 4.
Meadow-browns, The, 180.
Meadow Fritillary, The, 119.
Media, 9.
Medial cross-vein, 10.
Medio-cubital cross-vein, 10.
Megathymidæ, 258.
Megathymus cofaqui, 258.
yuccæ, 259.
melinus, Uranotes, 223.
Mellichamp, Dr., 72.
metacomet, Euphyes vestris, 284.
Metal-marks, The, 213.
Metamorphoses of Butterflies, 20.
metea, Erynnis, 277.
Milkweed Butterflies, The, 204.
Miller, Joaquin, 129.
Millers, 36.
Mitoura damon, 229.
Molting, 23.

Monarch, The, 204.
monuste, Pontia, 72.
Mormon, The, 275.
morpheus, Tharos, 130.
Moths, 36.
Mountain Silver-spot, The, 118.
Mourning Cloak, The, 148.
Mouth-parts, 4.
Mulberry-Wing, The, 273.
Murtfeldt, Miss, 90.
myrina, Brenthis, 122.
mystic, Thymelicus, 281.

napi cruciferarum, Pieris, 76.
napi, Pieris, 75.
napi, Pieris oleracea, 76.
napi virginiensis, Pieris, 76.
Nathalis iole, 86.
neglecta, Cyaniris ladon, 251.
Neonympha gemma, 194.
phocion, 196.
nephele, Cercyonis alope, 185.
Net, 29.
nicippe, Eurema, 97.
niphon, Incisalia, 234.
Nomiades lygdamus, 245.
norna, Œneis, 193.
Northern Cloudy-wing, The, 296.
novangliæ, Pieris rapæ, 78.
numitor, Ancyloxipha, 272.
nycteis, Charidryas, 127.
Nymphalidæ, 102.
Nymphs, 102.

Oarisma powesheik, 273.
Ocelli, 4.
Œneis norna, 193.
oleracea, Pieris napi, 76.
Olive Hair-streak, The, 229.
Olympia Orange-tip, The, 83.
olympia, Synchloe, 83.
Ommatidia, 3.
Orange Sulphur, The, 95.
Orange-tips, The, 81.
Osmateria, 43, 46.
Otho Skipper, The, 279.
otho, Thymelicus, 279.
Outer margin, 6.

Painted Beauty, The, 156.
palæmon, Pamphila, 272.
palamedes, Papilio, 55.
Palamedes Swallow-tail, The, 55
Palmer, Alice Freeman, 222.
Palpi, 4.
Pamphila palæmon, 272.
Pamphilinæ, 261.
Papilio asterias, 63.
brevicauda, 61.
cresphontes, 57.
glaucus, 51.
palamedes, 55.
polyxenes, 62.
thoas, 56.
troilus, 59.
Papilionidæ, 45.
Papilionoidea, 35.
Parnassians, 42.
Parnassiidæ, 42.
Parnassius smintheus, 43.
Patagia, 16.
Pearl Crescent, The, 129.
Pearly Eye, The, 189.
peckius, Polites, 282.
pegala, Cercyonis, 188.
Pepper and Salt Skipper, The, 271.
persius, Thanaos, 299.
Persius's Dusky-wing, 299.
phaeton, Euphydryas, 125.
philea, Callidryas, 87.

philenor, Laertias, 66.
philodice, Eurymus, 92.
phocion, Neonympha, 196.
Phœbis agarithe, 90.
Pholisora catullus, 297.
Phycanassa viator, 287.
vitellius, 288.
Phyciodes tharos, 129.
Pieridæ, 69.
Pierids, 69.
Pieris napi, 75.
rapæ, 78.
plexippus, Anosia, 204.
Poanes massasoit, 273.
pocahontas, Atrytone hobomok, 275.
Polites peckius, 282.
Polygonia, 133.
Polygonia comma, 140.
comma dryas, 140.
comma harrisii, 140.
faunus, 138.
interrogationis, 134.
interrogationis umbrosa, 135.
progne, 143.
progne, l-argentum, 143.
polyxenes, Papilio, 62.
Pontia monuste, 72.
protodice, 73.
pontiac, Limochores, 285.
portlandia, Enodia, 189.
powesheik, Oarisma, 273.
Powesheik Skipper, The, 273.
Primaries, 6.
progne, Polygonia, 143.
Prolegs, 22.
proserpina, Basilarchia, 170.
proserpina, Chlorippe clyton, 176.
proteus, Eudamus, 292.
protodice, Pontia, 73.
protodice vernalis, Pontia, 73.
pseudargiolus, Cyaniris, 251.
Purple Disk, The, 240.
pylades, Thorybes, 296.

Queen, The, 207.

Radial sector, 13.
Radio-medial cross-vein, 10.
Radius, 9.
rapæ immaculata, Pieris, 78.
rapæ novangliæ, Pieris, 78.
rapæ Pieris, 78.
Red Admiral, The, 154.
Red-barred Sulphur, The, 87.
Red-spotted Purple, The, 166.
Regal Fritillary, The, 112.
Rhabdoides cellus, 294.
Riley, James Whitcomb, 179, 212.
Riodiniaæ, 213.
Roadside Butterfly, The, 92.
Roadside Skipper, The, 270.
rosa, Synchloe olympia, 84.
Rusticus scudderi, 246.

Sachem, The, 278.
samoset, Amblyscirtes, 271.
sassacus, Erynnis, 276.
Satyrodes canthus, 191.
Saunders, 241.
Scales of butterflies, 17.
Scent-glands, 18.
Scent-organs, 43.
Scudder, 82, 112, 114, 119, 121, 157, 164, 169, 183, 247.
scudderi, Rusticus, 246.
Scudder's Blue, 246.
Sea-coast Graylings, The, 185.
Secondaries, 6.
Sector, Radial, 13.
Semnopsyche diana, 110.

Short-tailed Papilio, The, 61.
Silver-bordered Fritillary, The, 122.
Silver Crescent, The, 127.
Silver-spot Fritillary, The, 117.
Silver-spotted Skipper, The, 293.
Silvery Blue, The, 245.
Skippers, 36, 256.
Skippers with a Brand and their Allies, 261.
Skippers with a Costal Fold and their Allies, 288.
Sleepy Dusty-wing, The, 297.
Sleepy Yellow, The, 97.
Small Metal-mark, The, 213.
smintheus, Parnassius, 43.
Smith and Abbot, 88.
Snout Butterfly, The, 210.
Sooty-wing, The, 297.
sosybius, Cissia, 199.
Southern Cloudy-wing, The, 295.
Southern Wood-nymph, The, 188.
Sovereigns, The, 162.
Spenser, 68, 169, 175.
Speyeria idalia, 112.
Spreading-board, 32.
Spring Azure, The, 249.
Sthenopis, 10.
Stoddard, 239.
strigosa, Anosia berenice, 208.
Striped Hair-streak, The, 228.
Strymon titus, 234.
Subcosta, 9.
Swallow-tails, 45.
Swarthy Skipper, The, 284.
Synchloe genutia, 82.
olympia, 83.
olympia rosa, 84.
Synopsis of the groups of butterflies, 35.
Table for determining the families of butterflies, 39.
Tailed Blue, The, 254.
tarquinius, Feniseca, 237.
Tarsus, 5.
Tawny-Edged Skipper, The, 281.
Tawny Emperor, The, 175.
telamonides, Iphiclides ajax, 49.
tessellata, Hesperia, 300.
Tessellate Skipper, The, 300.
Thanaos brizo, 297.
icelus, 298.
juvenalis, 300.
lucilius, 298.
martialis, 299.
persius, 299.
tharos, Phyciodes, 129.
Thecla acadica, 224.
calanus, 226.
liparops, 228.
Thistle Butterflies, The, 153.
thoas, Papilio, 56.
thoe, Chrysophanus, 239.
Thompson, Maurice, 255.
Thorax, 5.
Thoreau, 151, 248.
Thorne, R. H., 81.
Thorybes bathyllus, 295.
pylades, 296.
Thymelicus brettus, 279.
cernes, 281.
mystic, 281.
otho, 279.
Tibia, 5.
Tiger Swallow-tail, The, 51.
titus, Strymon, 234.
tityrus, Epargyreus, 293.
Trochanter, 5.
troilus, Papilio, 59.
turnus, Papilio glaucus, 51.

umbrosa, *Polygamia*, 135.
Uranotes melinus, 223.

Vanessa atalanta, 154.
cardui, 158.
huntera, 156.
vanillæ, *Agraulis*, 107.
Variegated Fritillary, The, 109.
Veins of the wing, 7.
Venation of the wings, 7.
verna, *Euphyes*, 283.
vernalis, *Pontia protodice*, 73.
vestris, *Euphyes*, 283.
vialis, *Amblyscirtes*, 270.
viator, *Phycanassa*, 287.
Vice-reine, The, 173.
Viceroy, The, 170.
violacea, *Cyaniris ladon*, 250.
violacea-nigra, *C. ladon*, 250.
Violet-tip, The, 134.
virginiensis, *Pieris napi*, 76.
vitellius, *Phycanassa*, 288.
Vitellius Skipper, The, 288.

walshii, *Iphiclides ajax*, 49.
Wanderer, The, 237.
Whirlabout, The, 279.
White-m Hair-streak, The, 221.
White Mountain Butterfly, The, 193.
Whites, The, 71.
Wings, 5.
Wittfield, Dr., 56.
Wordsworth, 116, 226, 228.

Yellow Spot, The, 282.
Yellows, The, 84.
Yucca-borer, The, 259.
yuccæ, *Megathymus*, 259.

zabulon, *Atrytone*, 274.
Zabulon Skipper, The, 274.
Zebra, The, 201.
Zebra Swallow-tail, The, 49.
Zerene cæsonia, 90.

THE END

23951

QL
549
.C68

23951 QL
549
Comstock, J. H. .C68

How to know the butterflies.

'71 (21 issues)

DATE	ISSUED TO
JAN 6 1981	Jenny Busse 129
FEB 2 1981	BINDERY

KLINCK MEMORIAL LIBRARY
Concordia Teachers College
River Forest, Illinois
60305